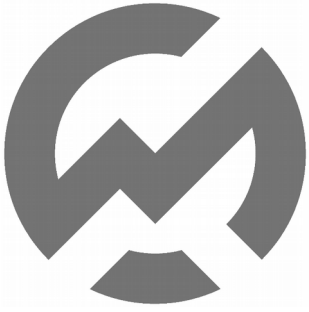
BE A CLIMATE WARRIOR

ACCEPTING A NECESSARY CULTURAL SHIFT

ERIC WRIGHT



Published December 2023
by Indies United Publishing House, LLC

Edited by Jennie Rosenblum

FIRST EDITION

ISBN: 978-1-64456-677-0 [Hardcover]
ISBN: 978-1-64456-678-7 [Paperback]
ISBN: 978-1-64456-679-4 [Mobi]
ISBN: 978-1-64456-680-0 [ePub]

Library of Congress Control Number: 2023949078

INDIES UNITED PUBLISHING HOUSE, LLC
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QUINCY, IL 62305-3071
INDIESUNITED.NET

To my Grandmother, Carolyn Wright,

who has always called me her "Nature Boy."

Be a Climate Warrior

Accepting a Necessary Cultural Shift

Eric Wright

INDIES UNITED PUBLISHING HOUSE, LLC

Global warming is one of the most extensively studied and widely discussed topics in human history. Due to the vastness of this subject, the incessant barrage of information via news and social media, and the fossil fuel industry's surreptitious manufacturing of misinformation, many feel simultaneously overwhelmed by and lost in the issue. On the other hand, some do not and many fail to understand *what* is being lost or realize how far we have wandered into unsustainability. If you are trying to make a difference and help our climate and environment, how can you be sure of the best starting points? Or if you already feel you live quite sustainably, are you certain you and your community function in a manner that is anywhere approaching true sustainability? Perhaps you can't answer this question without first agreeing on a definition of *true sustainability*. This will be discussed later.

I created this book to cast a blacklight over your life and your connection to society and the planet that sustains us, illuminating the carbon-scrubbing and earth-healing opportunities that lurk everywhere. Many of us are relatively unaware of the sources of our greenhouse gas emissions and how we can reduce them. Some of us are even skeptical about whether one person's actions can make a difference in the grand scheme of climate change. We may acknowledge our *individual* capacity to impact the world around us is limited, but this does not justify the great mistake of doing nothing. No matter how minuscule an individual action or organizational step change may be, if multiplied by a magnitude of millions, that change is certainly impactful. Regarding climate change, your actions are more important than you might think, particularly in the near term.

Through this book, I hope to motivate you to alter some of your behaviors, and perhaps even some of your aspirations, for the benefit of our climate. Together we can crowdsource greenhouse gas emission reductions. Although an unrealistic expectation, if every American were to integrate the 30 actions from this book into their everyday lives, we would collectively reduce our nation's annual greenhouse gas emissions by roughly 38%. For comparison, this would be equivalent to decarbonizing the entirety of our commercial, residential, and electric power sectors.

Similarly, if more individuals in the United States, and elsewhere, were to embrace the concepts and perspectives shared in this book, we would stand a better chance of transforming the private sector and ameliorating the damage we are inflicting on our planet in a timely manner. Such ambitions won't be realized without millions of us deepening our awareness of climate change and society and fighting over the next many years to change our trajectory. A deeper awareness of the status and pace of global ecological issues can give us purpose while strengthening our relationship with the natural world. It can compel us to leverage our careers and lifestyles to help transform society from its current condition into a more sustainable civilization. The necessary changes are both profoundly political and personal. Ultimately, our problem with our climate, like with so many other issues, is a byproduct of the struggle between private and social interests on individual, organizational, and international scales.

Ignoring individual accountability for now, there is so much pessimism surrounding climate change because the world seems to have been crystallized to preserve existing profit and power structures regardless of the environmental and social costs. These structures are not unbreakable; in fact, they are quite fluid. This fluidity, or potential for dissolution, is reflected in current political and social campaigns led by stakeholders in the fossil fuel industry and other major industries. Many stakeholders fear the popular vote and know public perception and public will can drive socially and environmentally just regulatory transformations that threaten certain revenue streams and business models. However, if public will is lacking or voters are suppressed, this creates a suitable environment for regulatory paralysis and detrimental business activities. Whether price gouging for prescription drugs, spewing dangerous carcinogenic pesticides, facilitating labor exploitation and human rights abuses, or broadcasting assiduously filtered and highly misleading news and information to morph the worldview of a targeted segment of the population, certain affairs cause the public to question whether the corporations responsible are improving or hindering our society. We must work to put the businesses hindering society in check and not let ourselves be deceived by narratives and cultural phenomena constructed out of concern for continued profit.

For example, it may be difficult to precisely measure the effects of fossil-fueled propaganda, let alone accept that maybe we too have been influenced by it. Its overall effect, however, is more apparent when viewed holistically as the harsh dissonance between the pace of climate change and the pace of climate action. Despite the urgency and severity of climate change, there is a relative lack of concern and behavior change among the general public. Much of this can be

attributed to propaganda and disinformation; however, there is a more pervasive sociological issue.

For far too many, enough is never enough, and this discontentment can lead to unending pursuits for excessively lavish and convenience-driven lifestyles and materialistic self-fulfillment. And by excessively lavish, I do not mean life in a mansion with four sports cars and a heated pool, but rather, a lifestyle that encompasses much of America's middle class. As we will discuss later in the book, we need to start thinking more seriously about what the Earth can reasonably provide and what that looks like apportioned among 8 billion people. In its never-ending quest for more, humankind has pinned itself in a corner. Many of us are confronted by the reality that our current way of life and our current perception of the world around us may be dramatically off-kilter from what it needs to be to achieve true sustainability. Many of us either live or strive for lifestyles incompatible with a livable future. I hope we are able to come to this realization and change on our own terms rather than being shocked into change by an ecological fallout. We *can* evolve beyond the destructive production and consumption patterns ingrained in our culture. But can we do it fast enough?

To be very clear, we are working under an extremely tight deadline to achieve carbon neutrality and then reverse historical emissions. Our race has marched forward like a bulldozer, and now we are faced with the aggregate of centuries of accumulated ecological burdens. Yet we have just a few decades remaining to transform our global civilization. This is so little time to accomplish something of such great magnitude. Humanity's planetary impact is a climatological and geological anomaly, standing out from the Pleistocene and Holocene and being permanently recorded in geologic records. Not only are we witnesses of the most crucial moment in human history, but also one of the most significant moments in Earth's history. This moment is humankind's greatest challenge—safeguarding our planet from ourselves. We must somehow prevent ecological ruin, preserve biodiversity, and regulate the atmosphere of our poverty-stricken, overpopulated planet. And this is the pivotal decade.

Today, immoderation and nearsightedness come at an incalculable cost. The present human experience is creating a mountain of suffering and loss for all species and future generations. Business as usual is an exchange of enduring prosperity for permanent repercussions tied to one fleeting moment in history. Contemplating the situation objectively, there is no question that these repercussions outweigh current consumer desires, conveniences, and pleasures. In acting for our exclusive benefit we are selfishly squeezing every last drop out of our planet, squandering the bounty of billions of years of planetary

stabilization and evolution while ignoring our place in the greater whole. We are indeed a part of something so much greater than ourselves. The failure to realize this is a terrible disease. The ability to realize this, however, signifies a fundamental respect for others and other species, and a deep appreciation of the immeasurable beauty and value of the natural world. Although lying dormant within many, I believe this deep respect and appreciation glows in enough of us to steer society in the right direction. Our rate of progress will depend on how driven we are by these momentous circumstances.

We should feel the crushing weight of our climate predicament because how we act in this moment determines the challenges our children and grandchildren will face, and the habitability of future Earth. And that future Earth is not distant; it is likely the Earth you will still be living on. Due to our collective neglect, we are indeed flirting with a disaster encompassing all of creation. We have a responsibility. Knowing this and being aware of our status as Earth's ascendant species behooves all who strive to live virtuously to act. Regardless of whether you are Christian, Muslim, Hindu, Buddhist, a pantheist, a philosopher of consciousness, agnostic, or something else, we humans will fail on a level that pervades our spiritualities and the physical world if we continue living unsustainably and destabilizing the Earth's climate system. No entity other than humankind will intervene to solve humankind's greatest challenge. We cannot allow ourselves to continue neglecting this wonderful world to which we belong.

We have already lost the environmentally stable past from which we and all species evolved. Environmental extremes are being altered, amplified, and redistributed at a pace beyond the adaptive capacity of most plants and animals. Many aquatic and terrestrial species (including humans) are noticeably shifting poleward to escape the warming climate. Of great concern is the fact that agriculture supports one-quarter of our global workforce, but unpredictable, harsh, and simply different conditions brought by climate change will make it difficult to grow crops in the places we always have. Hot and arid conditions are already forcing some humans to flee to habitable regions where they can continue to grow food. When suitable conditions to grow food disappear, populations are forced to migrate, exacerbating "geopolitical risks."

What we now face is a potential cascade of climate catastrophes affecting all of society. Yet, global demand for fossil fuel is still growing to this day. Climate change's spectrum of destruction and erosion of global GDP will continue to amplify, *possibly* reaching a point where society agrees fossil fuels were a net detriment to humanity. No one is arguing that fossil fuels did not enable us to construct our current civilization, but we have now reached the point where

this source of energy is causing significant destruction.

There is no time for delay, despite the mixed messaging from those opposed to expediting climate solutions. At this stage, we can't afford to continue transitioning away from fossil fuels gradually. We have been transitioning gradually for a few decades. Although there is currently no panacea for our difficulties, we are far behind where we could be today had we been governing private interest more effectively and implementing existing solutions more extensively. Now is the time for action to secure a livable future. If we make significant headway over the next decade, remaining within a reasonable global carbon budget while positioning ourselves to achieve carbon neutrality by mid-century, we will likely enjoy a relatively stable future. If, instead, we continue down our current path and take longer to achieve net zero emissions, we will shackle ourselves to a turbulent future in a world more than 2.0°C (3.6°F) warmer than preindustrial times. If a human's body temperature changes by that same amount, it can be catastrophic. The Earth should be thought of as a massive biological organism vulnerable to similar magnitudes of change.

To avoid the grim consequences of our emissions, we must rapidly reduce them NOW. These consequences can be forestalled by an army of many making several *immediate* changes that, when aggregated, can have a significant impact on our planet. These changes, however, must extend beyond personal behavior change into the arenas of politics and community engagement. Global greenhouse gas emissions can be reduced through individual actions, but global carbon neutrality cannot be achieved if society fails to gain control of corporations and repair public perception of the urgency of the climate crisis. It is this sense of urgency that is so important. At times, even I feel my own sense of urgency may be inadequate, despite all I do and don't do, knowing what the future may have in store for us. I fear the possibility of finding myself later in life, looking out with regret at a severely degraded world, unable to at least say, "Well, I tried my best to help." If you believe your perception is accurate, you can surely see those around you who lack an adequate sense of urgency. We are everywhere.

Much of our population has become so divorced from nature they view it as something to overcome and exploit rather than something we are part of and work in symbiosis with. The former, oversimplified perspective tends to be held by those with more of a hierarchical, red-in-tooth-and-claw, purely competitive worldview. This perspective is ingrained in the Western ego. Although it may sound idealistic, the latter perspective is indeed the way of the natural world. Many people tend to dwell on the violent and predatory macrolevel episodes within Mother Nature while overlooking the countless mutually beneficial,

interdependent, coadaptive relationships between species. Perhaps this is because much of the beauty of nature isn't immediately apparent or even visible at the macrolevel. Upon further inspection, we have begun to understand the balance and harmony of systems and relationships in nature. Some great examples are the codependence of pollinators and plants and of plants and fungi. Another example is the disturbing truth that most of the cells in your body are not your own, are not under your control, and do not contain your DNA, but rather are cells of other species—fungi, bacteria, and other microorganisms—working miraculously as part of the hidden machine sustaining you. We can't take full credit for what we accomplish.

Because everything is so interconnected, and because the climate regulates life on Earth, we can be certain basking in the urgency and reducing our emissions will have profound benefits beyond our understanding. We are all undoubtedly enveloped by Mother Nature and still surviving. Our food production is dependent on the weather and climate, our energy consumption fluctuates with the seasons, our homes and furniture are born of the forest, and our lives are eternally interconnected with nature. Even modern politics has been sculpted by climate change and surprisingly, climate change has divided us. Some of our disagreements stem organically from the differing needs and perspectives of urban vs rural populations and of wealthy vs poorer populations. Certain lifestyles and livelihoods are more at odds with the changes that must be made. However, climate change and other contemporary issues necessitate changes that threaten the stability or existence of certain institutions. Many of these institutions, fighting to preserve outdated systems and ways of thinking, are themselves deliberate perpetrators of the great divide in the United States and elsewhere. Rather than remain crippled by this divide, it is more natural to find common ground as an interconnected species exposed to our shared impacts on Mother Nature and each other.

Collectively, we tend to take combative attitudes toward one another, and there is much room for improvement in the ability of generations, nations, and individuals to communicate with each other. Regardless of our ideals and the unique struggles faced by different populations, we must all understand that our race will never escape nature. Although many have embraced lifestyles relatively insulated from the forces of nature and the very feeling of survival itself, this will continue to come at the expense of the future well-being of all humans and ecosystems until we become reasonably sustainable. Today, humanity must govern its decisions and industries to avoid a global collapse. Such a challenge should not sustain a great political divide but rather motivate us to unite to

increase our likelihood of success and, perhaps, develop sophisticated reforms to our current systems of governance. Certain reforms may be necessary to safeguard a robust democracy that can ensure the worst potential scenarios of late capitalism do not play out. These worst-case scenarios are short-run extrapolations of current tragedies harbored by our modern capitalist society, such as wealth inequality and global warming. These issues will break us if it remains feasible for companies to evade needed regulations, for the superwealthy to continue accumulating wealth while shirking social responsibility, and for individuals to pursue lives of limitless materialism.

The stage is set and it's time to act. You can be a warrior fighting to reduce your emissions and to enhance corporate and public commitment to aggressive emission reductions. Climate change is everyone's business. You can help build the solutions to global warming through your decisions and actions. You can evolve while aiding the evolution of corporate leaders, elected officials, technology, and industry. You can help accelerate this mass transformation by persuading others to join your efforts. All of us must band together, leverage social pressure, and confront the systemic issues perpetuated by our current capitalist economy.

I brought this book to life to help individuals reduce their footprints and interface with society to benefit our climate and the natural world. This manuscript serves as a personal climate change guidebook and toolkit, providing you with knowledge and mechanisms through which you can mitigate global warming and reduce your impact on our precious planet.

The book contains two primary elements. Half of the chapters include excerpts and stories designed to empower individuals to strengthen their involvement and establish broader roles in the climate battle. The other "action series" chapters present 30 recommended actions that contain practical advice for how Americans can reduce their individual carbon footprints by over one-third. The values of each of the 30 actions in this book are based on the *average* American's carbon footprint and lifestyle; however, no one is exactly average. Your exact footprint may be dramatically different. Luckily, you have a way of finding out exactly what your emissions are and how much you can reduce them.

In my free time over the past few years, I created a personal carbon footprint calculator, developed a website, and wrote this book to enable individuals to understand their emissions and see the benefits of changes they are willing to make. The 30 actions in this book are the same as the 30 actions on the website CarbonCurb.com.[1] Online, you can use the carbon footprint calculator

to calculate your *unique* personal emissions and interactively reduce them using the 30 actions. You can also use the website to share your story with others and get them thinking about their emissions. As part of your climate toolkit, the website makes this book more interactive and gives you a deeper understanding of how your lifestyle contributes to global warming.

The average American has roughly twice the carbon footprint of the average European and three times the carbon footprint of the average human. This book focuses primarily on Earth's problem children and thus, things the typical American should do to become more climate friendly. However, the actions in this book are relevant to all individuals with larger carbon footprints, regardless of nationality.

Be a Climate Warrior provides you with an array of 'weapons', tactics, and personal solutions, arming you with the knowledge and motivation necessary to join the ranks of the many climate warriors with a newfound flame of ambition—ambition to curb and eliminate emissions while simultaneously pushing society towards a greener future. It's time to awaken the climate warrior within you. Start flexing your climate muscles and shedding those extra pounds of carbon. You're officially headed into battle.

[1] *CarbonCurb.com provides a practical and evolving tool for climate-conscious individuals. You can use the website to calculate your unique footprint, reduce your footprint with the 30 actions, and encourage others to do the same.*

With the right knowledge, it's not hard to understand how we are altering the atmosphere of our planet. If everyone understood the scale of the impact of human activity on the climate, then we wouldn't be arguing about whether we should act or not. Unfortunately, much of the public is lacking basic proficiency in climate science. Climate misinformation and disinformation campaigns backed by the fossil fuel industry rely on this knowledge gap. Many people remain largely unaware of the vastness of the energy sector and perceive the Earth and its atmosphere as too enormous to be affected by anthropogenic emissions. Truly understanding the physical scale of the amount of fuel we burn, the emissions we release, and the Earth's climate system removes the abstractness of the threat to our planet. The following information aims to bring some clarity to our situation.

To begin, the atmosphere is thinner than you might think. If the entire mass of the atmosphere were converted into an equivalent mass of water and distributed around the planet, it would be only 33 feet deep. At sea level, there are only 14.7 pounds of atmosphere above each square inch of the Earth's surface. Most of this atmospheric mass is compressed near the planet's surface. Over 8% of the atmosphere lies below the top of the tallest building in the world, the Burj Khalifa. If you were to climb to about 5 km (about 3 miles) above sea level, you'd be standing above half of the molecules in the atmosphere. The summit of Mt. Everest is above nearly 70% of the Earth's atmospheric mass. At 50 km (31 miles) of altitude, a little more than a marathon distance, you'd be above 99.9% of the atmosphere.[1] The atmosphere is not a limitless vat for pollution.

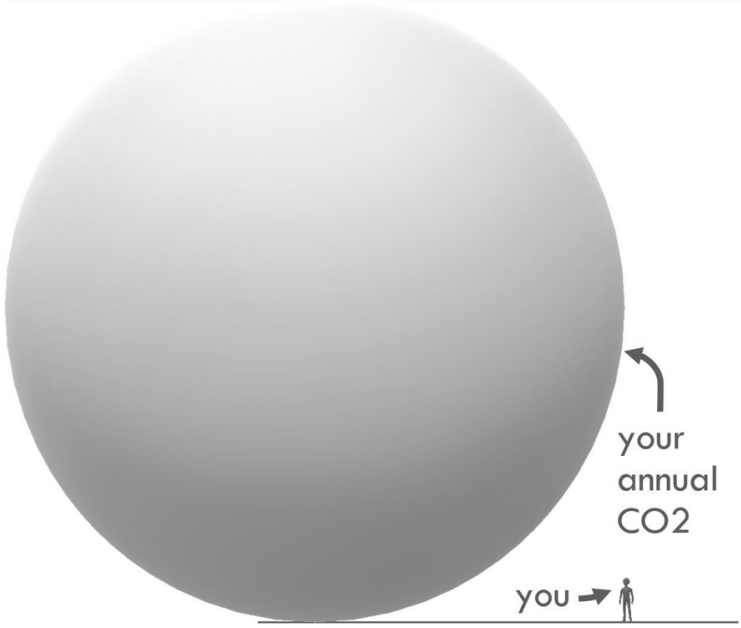
Global warming is driven primarily by carbon dioxide (CO_2) emissions because of the sheer quantity of CO_2 emitted by industry, automobiles, and other sources. However, CO_2 is just one of several greenhouse gases accumulating in the atmosphere due to human activity. Greenhouse gases (CO_2, methane, nitrous oxide, and others) are trace gases comprising less than one-tenth of 1% of Earth's atmosphere and play an important role in regulating the Earth's temperature. To describe the greenhouse effect, I like to use an analogy other than the function of a greenhouse.

Consider X-rays. X-rays have very short wavelengths that, unlike visible light, can pass through most tissues in the human body. Since bones contain

calcium and are denser than most other tissues in the body, they block some of the X-rays from passing through, and the resulting 'shadows' appear as bones in the X-ray image. The two-dimensional images created by X-rays are similar to a shadow cast by a tree on a sunny day. The electromagnetic radiation from the Sun, some of which we perceive as visible light, cannot pass through the tree. Similarly, ultraviolet radiation, which has shorter wavelengths than visible light, cannot pass through zinc oxide, titanium dioxide, and other ingredients in sunscreen. The unique physical properties of different types of matter determine how they interact with different wavelengths on the electromagnetic spectrum.

Sunlight interacts differently with the atmosphere than it does with the surface of our planet. Most of the sunlight reaching the Earth does not heat the atmosphere directly; it passes through it. The Sun heats the Earth's surface, and the Earth's surface then heats the atmosphere through direct contact and radiation. This is why the atmosphere gets colder as you go up and why there are snow-capped mountains. The Earth's atmosphere traps heat from the Sun that would otherwise escape into space because the atmosphere is more transparent to wavelengths of incoming solar radiation than to wavelengths of outgoing infrared radiation from the Earth's surface. Greenhouse gases allow sunlight to pass through them to heat the Earth's surface, and some of this energy that the Earth's surface has absorbed is re-emitted into the atmosphere at longer wavelengths of infrared radiation. Greenhouse gases are not transparent to these longer infrared wavelengths; they absorb and reflect the radiation back down to the Earth's surface. These gases regulate the Earth's temperature by enabling the planet to receive more incoming energy from sunlight than is radiated back to space. Without any greenhouse gases, Earth's average surface temperature would be approximately 0°F, in contrast to the current average surface temperature of about 59°F. So, we should be thankful for a certain amount of greenhouse gases, but an excess of them causes the atmosphere to retain too much energy.

Not surprisingly, overloading the natural balance of greenhouse gases in our atmosphere directly affects global temperature. The volume of greenhouse gas we are adding to our atmosphere is not insignificant, even at the individual level. The visual below will help you understand your emissions—the emissions attributable to the lifestyle of just *one* person.



This is the volume occupied by the annual CO2 emissions of the average American citizen. This bubble, or sphere, is over 80 feet tall and holds a volume equivalent to three-and-a-half Olympic-size swimming pools. Keep this visual of the average American's annual emissions in the back of your mind as you read the rest of this chapter. It'll help you gauge the scale of your emissions relative to the scale of human activity and understand that our planet is not so large. Try to imagine the above visual of one American's annual emissions multiplied by 30 years and by the 330 million citizens in the U.S.

Each year, the U.S. burns through hundreds of millions of tons of fossil fuels. The CO2 emissions from burning all this fuel weigh more than the original fuel source; each carbon atom in the fuel bonds with two oxygen atoms in the air during combustion to create CO2. The CO2 emissions that result from burning coal weigh twice as much as the coal did to begin with. Similarly, the CO2 emissions that result from burning a gallon of gasoline weigh roughly three times as much as the original gallon of gas.[2] A 2022 Ford F-150 has a fuel tank capacity of 23 gallons. One gallon of gasoline weighs about six pounds. This means using one tank of gas produces over 400 pounds of CO2. If the fuel tank is refilled about once every week, the Ford owner is emitting over 20,000 pounds of CO2 per year just for transportation.

In total, the U.S. emits billions of tons of CO2 every year.[3] Billions of tons of any solid material must occupy an incredible amount of space. Imagine the volume occupied by billions of tons of gas. Pretend we were to build a wall

around the U.S. Now, let's pretend we captured just one year's worth of our nation's CO_2 emissions and poured all that CO_2 inside our national wall. If that single year's worth of CO_2 were to be kept at ground level and distributed uniformly across all the land in the U.S. (including Alaska, Hawaii, Puerto Rico, and all territories), we would be standing in a "pond" of CO_2 over a foot deep.[1] That foot of CO_2 is from just one year of CO_2 emissions, but CO_2 stays in the atmosphere for several centuries. If we include U.S. emissions since 1990, our pond of CO_2 would be 30 feet deep.

All this gas is building up in our atmosphere along with emissions from other nations. Human activity has altered our atmosphere's chemical makeup and raised Earth's temperature by at least 1.1°C (2.0°F).[4][5] Consider, again, the sensitivity of the human body to temperature change. The two degrees of warming we have observed is a significant change for our planet. A single-degree change in average temperature can mean the difference between life and death for many creatures. A single-degree change in global average temperature is the difference between ice and ocean, multicolored corals and white skeletons, bearable hurricanes and insufferable major hurricanes, crop production and famine, forest and ash, and so much more. As Earth's global mean surface temperature continues to increase, more and more creatures will perish and systems will collapse. Aside from increasing the temperature of our planet, we humans are causing many other profound changes to Earth's biosphere. Part of the reason our impacts are so significant is because our planet is so heavily populated.

There are 8 billion humans on our blue, brown, and green spaceship. Our planet's equatorial circumference is approximately 25,000 miles or over 40,000 kilometers. If all humans were to stand in a single-file line on the Earth's equator we would encircle our planet more than 100 times. If the inhabitable areas of the 150,000,000 square kilometers of land on Earth were divided equally, each human would own a modest 100 by 100-meter area, roughly the size of a soccer field. You could run to your nearest neighbors in seconds. If humans were distributed evenly over the entire planet (across the continents and oceans) we would still be within earshot of each other. There's not a whole lot of space reserved for each individual on Earth. Would you be able to sustainably replicate your current standard of living if confined to your designated 100-by-100-meter area? Would you be able to procure enough food, shelter, and resources without having to encroach on your neighbors' plots?

Climate change and environmental degradation have become global issues primarily because of the vastness of human civilization and our enormous

population. We have expanded from our islands of civilization and now seek to protect our remaining islands of wilderness. Humans have made monumental achievements and far surpassed the survival threshold that had limited population growth before humans evolved. To truly prove our intelligence and realize our full potential, we must show we have a global consciousness and strategically avert a disaster of our creation.

Energy and resource conservation, and energy and resource efficiency, are tools we can leverage to rapidly reduce emissions and loss of natural habitats, with the former being the most impactful change we can make immediately. Advancements in renewable energy and energy-efficient technologies can have profound benefits, but society simply cannot function sustainably without conservation. Through conservation, we directly avoid the emissions and impacts associated with the consumption of energy and resources. We must conserve electricity, fuel, materials, and food, and we must reduce our consumption of non-essential products to minimize our environmental impacts. Conservation isn't just good for the climate and Earth's ecosystems; it is necessary for the welfare of society as a whole. To protect our planet's and society's future, we must acknowledge the fallacy of perpetual economic growth, dissociate our happiness from materialism, and combat climate change and environmental degradation as a unified international force. We can achieve much of this through individual, incremental adjustments.

Consider everyone you know who expresses concern about the climate crisis yet continues to make minimal sacrifices, using single-use containers, driving a mile or less when walking or biking is an option, and keeping their homes at that perfect temperature year-round. Is this cognitive dissonance reasonable? You may *currently* be one of these people. You can likely do so much more than you are currently doing to reduce your personal emissions and help our climate, but some inexplicable force seems to be holding so many of us back. The hardest part of becoming a climate warrior is establishing inertia. You can establish inertia through this book and with the personal carbon footprint calculator on CarbonCurb.com. This book and the website are designed to help you understand the emission reductions you can achieve through small lifestyle changes. You can discover how far you stand from carbon neutrality.

Simply having a benchmark and an awareness of your progress is a huge motivator, but there are benefits to reducing your footprint beyond minimizing your contribution to global warming. A climate-friendly lifestyle is also a more affordable lifestyle. Reducing your carbon footprint requires reducing your consumption of fuel, electricity, and products, and thus leads to a lower-cost

lifestyle. Individuals who significantly reduce their emissions using the 30 actions, presented categorically in each action series throughout this book, will save hundreds to thousands of dollars per year. If you take control of your emissions by changing your consumption habits and living a more carbon-aware lifestyle, you will help the climate and your pocket.

Nearly every activity, commute, purchase, and decision you make affects your contribution to greenhouse gas emissions and global warming. So, where do you start? If you are the average American, what are the sources of your personal emissions? The two largest components of your footprint are embedded emissions and personal transportation emissions, constituting roughly one-third and one-fifth of your annual emissions, respectively.

Embedded emissions are the greenhouse gas emissions involved in bringing a product or service to market. This includes all emissions generated through raw material extraction and farming, procurement/processing of resources, manufacturing goods, and transporting and selling the final products. For example, a diamond ring has lots of embedded carbon outside of what is within the stone. The embedded carbon in a diamond ring includes emissions from the energy-intensive mining and processing of materials, storing and transporting the materials, cutting the stone, casting the ring, creating packaging for the ring, and even putting the final product on display in a commercial building that takes electricity from a fossil-powered grid. Embedded emissions are EVERYWHERE and constitute the largest emissions category in the average American's footprint. As another example of embedded emissions, roughly one-quarter to one-third of the lifecycle emissions of your home are not from you and your housemates' everyday energy consumption but from the initial emissions embedded in the materials your home is made of. This includes upstream emissions from logging and forest degradation, processing and transporting lumber, mining metals, manufacturing shingles, producing cement, energy and fuel use during construction, and more. There is nothing climate- or eco-friendly about an extremely efficient, geothermally-regulated, solar-powered, 3,000-square-foot single-family home. Oversized houses require gluttonous amounts of resources and energy to build, maintain, and fill with stuff, and their outsized resource demands unnecessarily degrade our planet.

If you are a heavy consumer, meaning you believe you purchase more "things" than you need, or if you live a generally more lavish lifestyle, then embedded emissions likely make up the largest share of your footprint by far, even more than your transportation-related emissions. If you are the average American, the next largest portions of your footprint (after personal

transportation emissions) are residential emissions associated with activities at home and agricultural emissions from the food you eat. Certain sources of emissions are difficult to avoid on the individual level, but there are significant opportunities for you to reduce your emissions by changing a few things around your home. Additionally, agricultural emissions make up roughly 17% of your footprint, yet the food-related actions in this book account for 26% of the emissions you can save in total with the 30 actions. There are many reasonable changes we can make to curb our emissions.

The following pages provide a breakdown of the average American's footprint and the emissions they can save by following the advice in this book. The emissions information throughout this book is presented in terms of kilograms (kg) and metric tons (MT) of carbon dioxide equivalent (CO_2e).[ii] This makes it easy to compare emissions from various categories, which may contain different kinds of greenhouse gases. For example, lots of your agricultural emissions are in the form of methane and nitrous oxide rather than CO_2.

The Average American's Annual Carbon Footprint

Category		Component	(kg CO2e)
H	Home	Heating	720
		Indoor appliances & devices	520
		Miscellaneous & outdoor equipment	460
		Cooling	430
		Water heating	410
		Lighting	110
E	Embedded	Healthcare and personal care	1,600
		Household furnishings, equipment, & supplies	1,280
		Pets, apparel, & other miscellaneous	1,040
		Home embedded emissions	810
		Vehicle embedded emissions	670
A	Agricultural	Red meat	1,120
		Other meat, dairy, fish, & eggs	990
		Plant-based foods	530
T	Transport	School, social, personal, & recreational	1,180
		Work commute	840
		Shopping, errands, & other	830
		Flying	350
Other:	*Public infrastructure, military, water, & other public services*		*2,110*

Total Carbon Footprint: **16,000**

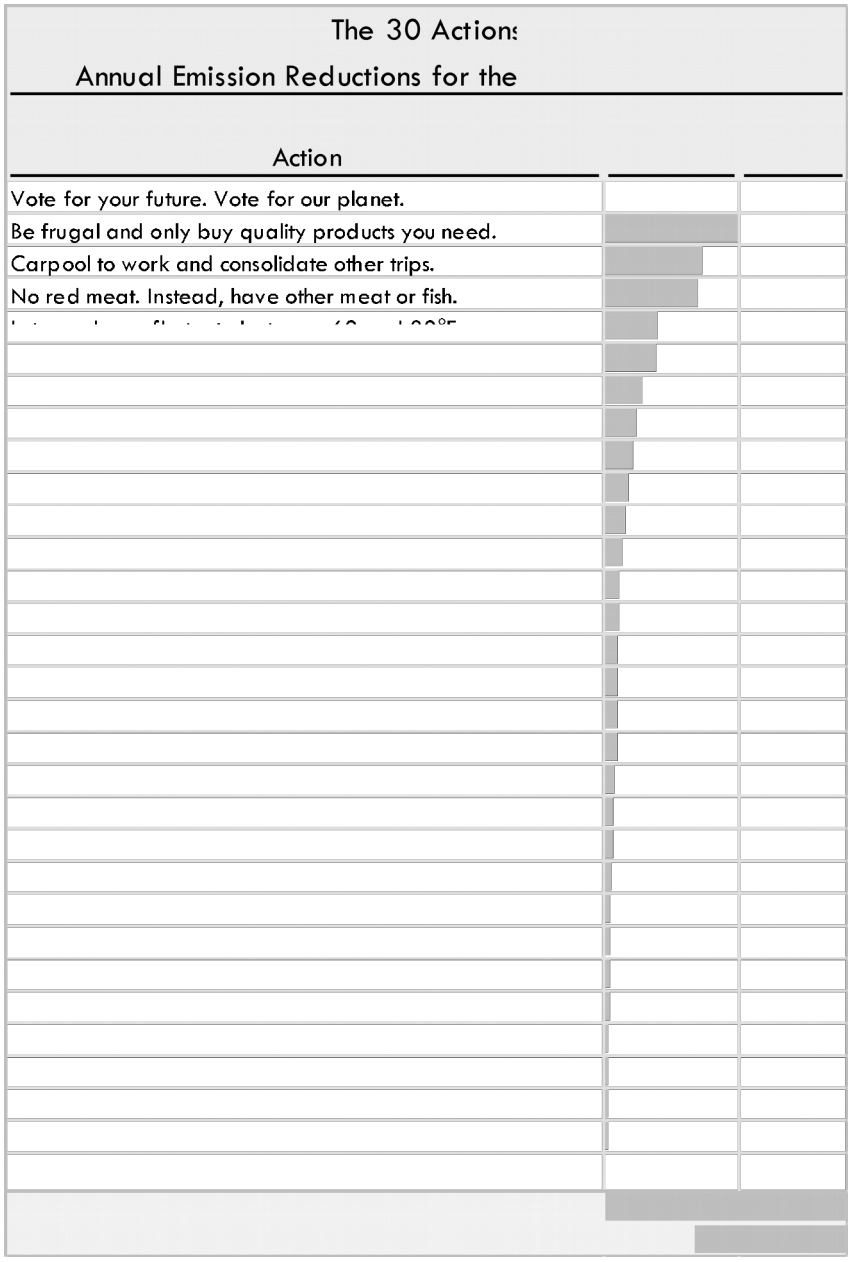
The Average American's HEAT Signature

H	Home	2,650 kg CO2e
E	Embedded	5,400 kg CO2e
A	Agricultural	2,640 kg CO2e
T	Transport	3,200 kg CO2e

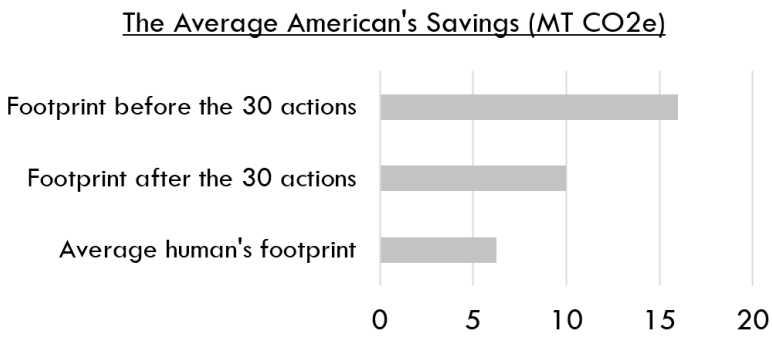
The figure above shows the major categories and subcategories of the average American's annual emissions. The major categories are emissions at home (H), embedded emissions (E), agricultural emissions (A), and transport emissions (T). Together, these four categories are referred to as your HEAT signature. As you can see, embedded emissions and personal transport emissions are the most prominent categories in the average American's HEAT signature. It is worth noting that the embedded emissions category shown above includes a great deal of emissions attributed to freight transport and shipping. If the transport emissions category included freight transport and shipping, it would be much larger. The above figure also shows several more subcategories, or components, of emissions within the HEAT signature. The footprint

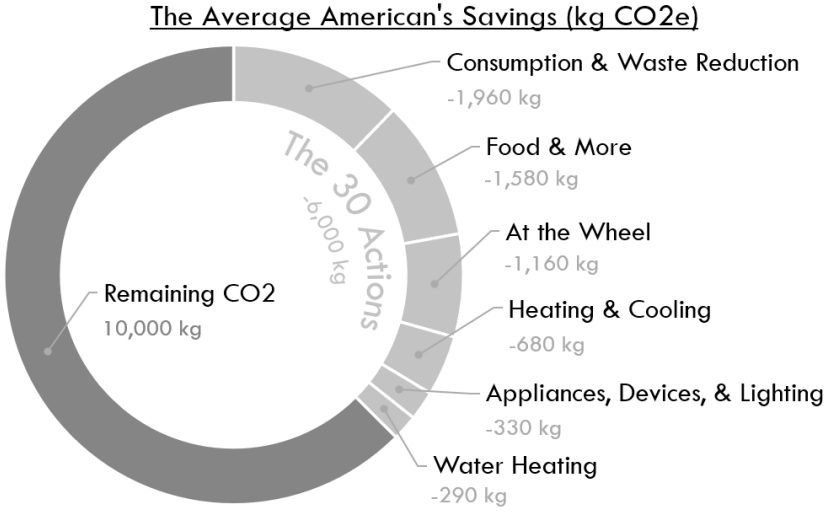
components decrease in magnitude from top to bottom. You may notice emissions related to healthcare and personal care are quite high. The energy and resources that flow through hospital and healthcare systems, and that are required for research and during the manufacturing of the personal care products and medicine we consume, cause a great deal of emissions in the U.S. Similarly, military operations, public infrastructure, water supply, and other public services contribute greatly to our collective emissions. Take a moment to let all the information in the above figure soak in. This is the starting point, or benchmark, for emission reductions. We can use this as a diagnostic tool to prescribe the most practical and effective solutions for individuals to reduce their emissions.

The 30 actions displayed in the next figure and discussed in each action series were selected by considering weighted factors of cost, convenience, environmental benefit, and greenhouse gas emission reduction potential. Generally speaking, the 30 actions avoid things that are currently not implementable for the majority of Americans or that require significant investment. My goal was to identify some of the most *practical* actions that still have a worthwhile impact on the typical American's carbon footprint. Based on a national average annual per capita footprint of 16 metric tons (MT) (16,000 kg or over 35,000 pounds), if the average American incorporated all 30 actions into their life, they would decrease their annual emissions by roughly 6 MT, or 38%. By taking this journey, you can dramatically reduce your contribution to global warming.



There are two figures below. The first figure compares an average American's emissions before and after adopting all 30 actions with the emissions of the average human. The second figure shows the emissions each action series will save the average American, and how much CO2 will remain in their footprint after adopting all 30 actions.





You have an opportunity to significantly reduce your present impact on our planet's climate. With every action you adopt, your lifestyle will become less carbon-intensive. Each action and series in this book will help you understand how to effectively reduce your annual greenhouse gas emissions. You can further enhance your understanding of your unique personal footprint and the impacts of your lifestyle choices by completing CarbonCurb's calculator and selectively toggling different actions on and off to reduce your footprint. The calculator is just as much a learning tool as it is a customized menu of recommended behavioral changes specific to your current circumstances.

While taking the journey through this book, you may realize it might not be feasible for you to complete *every* action, even though the actions were designed to be reasonably achievable rather than overly ambitious or expensive. This book is not just about understanding the effects of your lifestyle choices on our climate and understanding how your emissions might compare to the average American's emissions. Your experience in this book is equally focused on understanding climate change and society in general so that you may learn to

enhance your role in the climate battle through your career and your interactions with others.

Through the rest of this book, you will develop your sense of how to continuously adapt and alter your lifestyle to minimize your carbon and ecological footprints while also learning from the stories and additional information presented between each series. The journey to becoming a climate warrior is not instantaneous, but rather a long-term commitment. Together we can make significant personal carbon reductions and help accelerate our planet toward carbon neutrality. Without further ado, proceed to the training field, read each of the following excerpts, and adopt each of the 30 actions. Strengthen your role in the climate battle. Live a more climate-fit lifestyle. You better get in shape because society and your fellow climate warriors are counting on you!

[i]*This calculation is based on the density of CO2 at standard temperature and pressure.*

[ii] *One metric ton is equal to 1,000 kilograms, or 2,205 pounds. Carbon dioxide equivalent, or CO2e, is the equivalent amount of CO2 emissions with the same global warming potential as other greenhouse gases.*

The emblem of the climate warrior movement.

Whether your current engagement in the climate battle is scant or substantial, my hope is that this chapter will strike a chord and help you deepen your commitment to the greater effort of delivering broad climate and environmental solutions. For us to more effectively support the many necessary transformations, we must first establish a sober understanding of the gravity of our current situation, the degree of change necessary, and some of the challenges and threats before us.

Our perceptions of our collective impacts on the world around us modulate our beliefs about what we are doing right and what we need to change. Most of the environmental challenges we are faced with do not have a one-off fix. Unfortunately, many of these issues are so deeply ingrained in the fabric of our economy and society that they require recalibrating our current way of life.

Climate change is part of the broader issue of unsustainability. The general public's perception of what qualifies as sustainable and what doesn't demonstrates how far we have strayed from living in balance with our natural resources. For many individuals, "sustainability" has connotations of moderately bounded consumption patterns and negligible behavior change. Often, these consumer behaviors are not significantly constrained, nor are they driven by necessity, and are only superficially "sustainable." In other words, people may believe they are living sustainably, when in fact their lifestyles far exceed *true* sustainability, or the threshold rate of consumption required to strike an ecological balance if all other humans were to consume in the same manner and at the same rate. On an overpopulated planet, consumption itself is not

sustainable if unnecessary or excessive in the first place.

We rely on signals from the world around us to develop our own unique perceptions of normality and sustainability. Greenwashing and eco-labeling schemes can make us believe our way of life is good for the planet, often distracting us from the more apparent impacts of our consumption. For example, I went for a beer run in Austin, TX, and at the store, I noticed New Belgium Brewing Company's carbon-neutral-certified Fat Tire Amber Ale. At first, this made me feel warm and fuzzy inside, but that feeling was fleeting as I realized the inevitable environmental impact of my purchase. Aside from my purchase not being need-based and the pollution produced by consuming six manufactured bottles and a cardboard container, the carbon-neutral certification likely only accounts for the emissions before and during production. New Belgium Brewing Company is headquartered in Fort Collins, CO, which means the beer was shipped roughly 1,000 miles from the Rocky Mountains all the way to Austin, TX. I found the beer in a refrigerator at an H-E-B supermarket, and when you purchase something that takes up refrigerator or freezer space in a commercial building, there are emissions associated with that energy consumption. If, hypothetically, every human were to make a similar purchase each week, by 2050 the purchased bottles would cover an area the size of Texas, Louisiana, and Mississippi.

In a land of plenty, the greenest consumer behavior is curtailing the consumption of non-essential goods altogether. It isn't unreasonable to indulge ourselves in moderation, but we shouldn't live in denial of the impacts of doing so. It is worth mentioning, however, that New Belgium Brewing Company and many other companies are making honorable efforts to reduce their emissions and source their materials and ingredients more sustainably. These companies deserve recognition for their efforts, and we can support them by selecting their products over environmentally inferior options.

With regard to global environmental issues, achieving *true* sustainability requires striking a holistic ecological balance that considers all connections between resource depletion, pollution, and the very functioning of nature and our civilization. Given the limited space on our planet and our current population of 8 billion, this is not achievable without both guiding and limiting consumption. Thus far, our efforts to moderate our collective impact on the natural world have proven woefully inadequate and yielded inconsistent results. We have gone far beyond the point of balance and are jeopardizing ourselves. We conceited apes are but a blip in the universe, one of the many products of billions of years of evolution, yet we have the potential to safeguard our entire planet from our own

advancement. It is unlikely we will achieve this, however, if each of us does not understand the immense value of doing so and if we do not believe our individual actions will play a crucial role.

More often than not, climate and environmental solutions act harmoniously with one another—measures that curb emissions also reduce other ecological burdens. The concomitant ecological benefits of reducing greenhouse gas emissions are further incentive to change our ways. Benefits flow both ways, however, as there are solutions to major environmental and social issues that have secondary emissions benefits. Climate change, after all, is an interdisciplinary issue through and through. A cultural shift towards low-carbon living and sustainability inherently requires scaling back *our own* consumption of energy and resources while promoting and contributing to broader climate and environmental solutions. Unfortunately, there appears to be a fog shrouding the connection between each of our personal actions and decisions, our climatological and ecological footprints, and the path to a net-zero planet. This global net-zero goal, which must be achieved within a few decades, is most feasible if supported at the grassroots level and if the individual burdens we place on this planet are minimized from now onward. By acting selflessly and altering our lifestyles, we slow the carbon clock.

We can change our ways, encourage others to follow along, and tighten the reins on corporations. These are all important elements of the climate battle. The climate battlefield is in your conversations with others and at the polls. The battlefield spans from remote farmland to downtown office buildings. The climate battlefield is the food on your plate, the weight of your foot on the pedal, the duration of your shower, the temperature of your home, the damp clothes on your drying rack, how long you leave the front door open, and avoiding consumerism and wastefulness. The battlefield is all these moments and decisions and so much more.

Of all the elements of the climate battle, behavior change is perhaps the least leveraged solution in the U.S. This represents a major opportunity. Behavior change has the technical potential to be one of our major sources of emission reductions, working alongside renewable energy deployment, technological advancements, federal and state regulations, and prudent business decisions.[6][7][8][9] Using the recommendations from this book to alter ingrained lifestyle patterns, the U.S. could *collectively* reduce its emissions by nearly 40%. This climate solution is not inhibited by a lack of policy or technology, but rather a lack of awareness, concern, and effort.

Caught up in our industrious, metropolitan, day-to-day routines, nature is

normally out of sight and out of mind. In this default state of mind, our awareness of and concern for what is happening to the natural world is suppressed, and this numbness and distance festers into continual indifference. We lack a common collective knowledge of and deep respect for Mother Nature, as well as an understanding that we are one with the system. By broadening our understanding of how we must change for the betterment of the climate and the natural environment, we can more effectively sculpt the mentality of our society into one of a sustainable civilization that avoids unnecessary and counterproductive activities. If you throw away food, someone has to grow more food, you have to pay for it, and the stress you have placed on the environment is increased. If you keep your thermostat at 70°F rather than 80°F on a 100-degree day, someone has to produce more energy, you have to pay for it, and you cause more emissions to be added to the atmosphere than necessary.

In summary, what is missing is a collective concern for and awareness of externalities. Externalities can be thought of as the societal and environmental consequences of an individual's or organization's decisions and actions. Just because something may be more convenient or cost-effective today, does not necessarily mean it is better in the long-term for you or our civilization as a whole.

Externalities become less direct as the population of a civilization increases. The connections of individual actions and behaviors to their respective consequences are more distorted within larger, more complex civilizations than within small civilizations with limited diversity of specializations and limited access to resources. The average American is a walking beacon of externalities. We are clueless about the origins of most of the things we buy. Our supermarket shelves are stocked with thousands of different products, each with its own set of externalities ranging from emissions to dispersion of human carcinogens to exploited labor in poorer nations.

It isn't just an issue of what we consume; it's also an issue of quantity and waste. Think of some of the things you do which may be motivated by short-term reward, whether convenience-driven or in pursuit of pleasure or profit, for which you overlook the impact on society or the environment. Seemingly inconsequential things, like throwing away a little bit of food, or taking an extra flight for a spontaneous weekend getaway, amass to something significant when considering society's collective impact on the Earth. The pieces of plastic that besmirch beaches and roadsides are perhaps equally your doing as they are everyone else's. This may be true even if you recycle because many areas in our country lack the infrastructure and public awareness necessary to successfully

execute recycling programs. After decades of communication and public education campaigns, people still aren't recycling.

The point is the environmental burdens from our expansion and consumption have been amassing for centuries. Many of them are out of sight and out of mind. Eventually, we may suffer the full consequences of our unsustainable behavior. Eventually, once a critical mass of negative externalities is reached, civilizations experience horrible consequences and learn the hard way the importance of considering externalities proactively rather than retroactively.

Let's take our global civilization of roughly 8 billion and scale it down to a fictitious civilization of just 50 inhabitants on a small island. Within this shrunken society, every individual has their place, and it is clear if someone isn't carrying their weight. Responsibilities and specializations are less diverse, as are the technologies and goods produced. Overall, we are less capable and more vulnerable than larger civilizations. We must make the most of all our opportunities and resources. We have a phenomenal recycling program, are unfamiliar with the concept of food waste, and are keenly in tune with the Earth. We are sustainable!

A few years ago, the hot shower was invented by a resident of our island. However, recently the hot shower was discontinued. What a luxury it was, but within a few years we realized the growth rate of the trees on our island was outpaced by the demand the hot shower was placing on wood products. Furthermore, our crop yields decreased as individuals devoted less time to agriculture and more time to harvesting wood and as pollinator species and freshwater sources began to decline due to deforestation. The leader of our island, seeing the clearly labeled figures presented by our most knowledgeable scientists, gave a speech and ordered our island's 50 inhabitants to discontinue hot showers so we could continue to have a sustainable supply of wood products for our most important food, shelter, and fishing-related activities.

Breaking from fiction, a real-world example relevant to our fictional scenario is the history of Easter Island. Easter Island is most famous for its monumental stone figures called moai, which were created and transported by the early Rapa Nui people. The moai are an important part of Rapa Nui culture and serve to commemorate their ancestors. Despite having access to extremely limited resources, the Rapa Nui islanders developed a relatively advanced civilization, and managed to carve and transport nearly 1,000 moai. However, after centuries of thriving on Easter Island, the Rapa Nui experienced a cultural collapse. Although subject to ongoing research and debate regarding the primary factors that contributed to the cultural decline, it is known that an ecological

collapse occurred due to the island's resources being exploited at an unsustainable rate.[10][11][12][13] There is also evidence supporting the theory that the Rapa Nui people persevered despite deforestation and biodiversity loss until European contact, after which disease, slave raids, and other issues caused a more dramatic decline.[14][15][16][17] In all of the theories surrounding the decline of the Rapa Nui people, a healthy, productive ecosystem was transformed into an empty landscape devoid of the flora and fauna it once supported. Land clearing for cultivation and other factors contributed to the gradual deforestation of Easter Island. As prominent tree and plant species became extinct, land animals, birds, and insect populations were greatly reduced if not eradicated. Without a balanced ecosystem, which relies heavily on coevolved plant-animal relationships, the remaining plant and animal life did little more than resist extinction. Over time, as the vegetation disappeared, the island's sources of freshwater were drastically reduced.

Whether the main cause of the cultural decline on Easter Island was ecological or colonial in nature, the story is relevant to our current global predicament. Just as islands are closed systems, the Earth is a closed system. Additionally, just as colonialism has destroyed and taken so much from so many in the past, it has simply evolved into neocolonialism under the abstractions and formalities of our modern global economic system. We cannot travel to another island to escape the consequences of climate change, and our global civilization is not immune to the systematic plundering of the Earth's limited resources. Perhaps historically significant ecological events such as the decline of Easter Island and the Dust Bowl on the Great Plains of North America are harbingers of the inescapable consequences of global warming. Although we may have the capacity to endure localized adverse conditions, will we be able to endure the universal suffering and species loss brought about by climate change? Will we allow the irreversible sacrifice of the equity of the commons in exchange for temporary private wealth?

Back on our fictional island, the story of Easter Island was the centerpiece of our island leader's hot shower discontinuance speech. Many wonder where we would be now had we not learned from the deterioration of our neighboring island. It is likely that many of the Rapa Nui people were aware of the negative impacts associated with their lifestyle choices, but certain cultural norms persisted despite the buildup of negative externalities. Luckily, we learned from the past and listened to our island's scientific community.

Today, the U.S. and other nations have adopted cultural norms and industrial systems that have operated unchecked until a point of devastation

because they are associated with short-term benefits for segments of the global population. We must overcome our nearsighted tendencies and use the facts and figures presented by our scientific community to guide government intervention to help society unsubscribe from counterproductive activities. On Earth, we are afloat a vulnerable space-island with finite resources. Thousands of systemic characteristics of our global society contradict the lessons learned on Easter Island and elsewhere. Today's nearsighted decisions are not caused by us being unaware of or incapable of tackling climate change and environmental degradation. We have a good sense of the changes that must occur to avoid catastrophe. The nearsighted decisions degrading our planet are prompted by greed, egoism, short-term profit, convenience, and our inner impulses and desires.

For example, it may seem rewarding to occasionally swing by the drive-through for a burger and fries rather than planning ahead and cooking at home. However, in the long term, beef and fast food are too resource-intensive, wasteful, and expensive for their regular consumption to truly serve as a convenience, especially when considering the incremental health consequences of each burger. Similarly, when an individual or an organization makes a capitalistic business decision, they may be aware of the associated negative externalities but ultimately decide that going through with the decision is worth it for the sake of profit or convenience. Take John Sylvan, the inventor of the K-Cup® coffee pod, as an example. Sylvan sold the product off to Keurig Green Mountain brewing company in 1997, and although the problem is now out of his hands it's probably not off of his mind.[18]

Since the '90s, the popularity of these Keurig pods has skyrocketed. The pods aren't recyclable, and today enough of them are produced each year to wrap around the planet several times.[19] Originally, Sylvan envisioned the pods being popular in workplaces rather than people's homes. Sylvan may or may not regret the environmental impact of his creation, but he wouldn't be wrong to point to the consumers as the root cause of the issue. This is indeed an issue that is driven by consumer choice and for the purpose of saving just a few seconds each day. Using the pods is more expensive, creates more pollution, and demands more energy and resources, yet many continue to consume them despite there being lower-impact alternative methods of making coffee, such as overnight cold-brew in a jar. For what it's worth, we stand to benefit from reducing our consumption of coffee and making it a more occasional treat. Our caffeine addictions are fed by an exploitative, global industry that causes considerable deforestation and degradation of tropical rainforests.

Among all the corporations making imprudent business decisions degrading our environment and our climate, Keurig is not the worst and does not deserve to be picked on over others. Keurig was simply chosen as an illustration of far-reaching corporate decisions driven by nearsighted consumer preferences. If all consumers were mindful of their ecological footprints, products like the K-cup® would never succeed. Speaking more broadly there are a lot of people willing to do whatever it takes to turn a profit. Those people can slip under the radar if consumers and the general public remain indifferent or uninformed. Money is a necessary evil, but conscious consumerism limits how evil it can be.

The greater single-use epidemic exemplifies the broader social issues of myopic consumption patterns and environmental indifference. Our country's single-use addiction is not sustainable and causes more emissions due to the continuous demand for manufactured materials. For many restaurants and companies in the food industry, a private gain can result from using disposables to avoid the cost of staff, equipment, and space required to clean reusable dishware and store it. This is just one example of a scenario where it is sometimes advantageous to conduct business in a manner that results in more emissions and waste. This is facilitated by cheap energy and a lack of policies to correct market failures by requiring companies to pay for the damages they impose on society. If externalities, such as the full social cost of greenhouse gas emissions from manufacturing and transporting single-use products, were built into the cost of goods, dishwashers and drying racks would likely be the less expensive option.

America insulates corporations from bearing the financial responsibility of the environmental externalities they cause. A carbon tax, or another holistic mechanism used to ensure products reflect the cost of their associated emissions, makes it less affordable for individuals and companies to engage in emissions-intense practices or buy products with high embedded emissions. Direct and indirect emitters of greenhouse gasses should face the full social cost of their actions. The Rapa Nui people may have benefited from environmental regulations, and their history is among many examples that demonstrate the need for regulations to support socially optimal markets. An economy-wide carbon tax or some form of carbon pricing can enable carbon-conscious consumerism to be the default, eliminating the guesswork on the part of the consumer. The revenue from a carbon tax can then be redistributed to middle-income and lower-income households, such that the majority of citizens are not faced with any change in their standard of living. Canada, for example, has implemented such a system.

Implementing a new tax on emissions or fuel would not be earth-shattering, even in the petrophilic United States. In fact, America has been taxing

motor fuel for a century, and today, in addition to an excise federal tax of 18 and 24 cents per gallon for gasoline and diesel, every state also taxes gasoline and diesel fuel, with an average state tax of 32 and 34 cents per gallon, respectively. [20] In other words, regarding the U.S. as a whole and assuming gasoline costs $3.50 per gallon, the combined federal and state tax of $0.50 per gallon means we are already paying roughly 15% in excise fuel taxes. Additionally, these are taxes that change regularly. Over the past decade, most states in the U.S. have increased or modified their fuel taxes. Despite regular, widespread, substantial changes to fuel taxes, many Americans are vehemently and blindly opposed to tax increases of any kind. Adding a carbon component to this widely accepted tax policy could be feasible as a big first step towards national carbon pricing. Carbon pricing is effective; dozens of countries have already implemented carbon taxes and emissions trading systems[21] Many sub-national jurisdictions also have emissions pricing systems or cap-and-trade schemes. As of 2022, the United States has no such nationwide system. We can't rely *exclusively* on government action for climate solutions, but there are many functions beyond military and infrastructure that can only be provided by the federal and state governments. Expediting decarbonization across all sectors of the United States economy is one of those essential functions. Corporations are not responsible enough to be entrusted with meeting needs and challenges such as these purely out of the generosity of their big hearts.

Unfortunately, given the *current* political struggles in the U.S., it is uncertain when or if we may enact a national carbon tax or issue sweeping federal regulations to reduce greenhouse gas emissions. Although the United States is behind many nations in implementing climate policies, certain states are ahead, and in many ways, the diversity among states within the U.S. makes our country fertile ground for producing novel climate solutions that can be scaled through interstate collaboration. Like our 50 island inhabitants, our 50 states have their own unique personalities and strengths. This holds true regarding climate and energy policy.

Aside from policy and technology, behavior change is a climate opportunity somewhat unique to America. Since we are the largest nation with an extremely high per capita emissions rate,[iii] we are uniquely positioned to make conserving energy and resources through individual behavior change one of our most important climate solutions. To become a climate warrior is to break through cultural norms to conquer your emissions despite being held captive on an island of emissions-intense resources. We desperately need this behavioral shift to occur today to supplement the adoption of technologies and policies

tomorrow.

In the U.S., the carbon-curbing actions in this book really do have a huge climate impact relative to what their impact would be in other countries. Unfortunately, it is much harder for an American to reduce their personal emissions to an 'acceptable' level than it is for a citizen from, say, Germany or Chile, purely because our per capita emissions are so much higher to begin with. Germany and many other successful developed nations have cultures and infrastructures that facilitate lower per capita emissions, with some of the core differences being better public transit systems, successful recycling and waste management programs, more renewable or nuclear energy, and a higher overall awareness of each individual's connection to the environment.

If a critical mass of Americans were to alter their lifestyles and mindsets to become more sustainable, it would have a global impact. Regardless of what policies and technologies are on the horizon in the U.S. and other nations, behavior change is necessary to avert an Easter Island scenario where we end up recklessly passing a climate tipping point. The United States is responsible for roughly a quarter of total historical global emissions. We are responsible for what we have done. Just as fleeing was not an option on Easter Island, it is not an option on Earth. We must immediately exploit all climate levers at our disposal. We cannot afford any more fossil fuel monoliths.

If you were aware of the far-reaching impacts of the American way of life before reading this book, you probably already understood individual change is necessary in parallel with fighting for broader, systemic changes. It will take the power of the unsettled masses to realize these changes at scale and to overcome opposing interests. By intensifying your involvement in the push for a sustainable future you will be joining the ranks of the millions of already committed Americans. This book is one sign of my commitment. The fact that you've made it this far indicates our commonalities. What might your project(s) be?

As we will see, the numbers are in our favor; we each just need to keep nudging those around us until they are awakened, motivated, and working toward similar goals by taking concrete action. We can dissolve the dam of complacency and reach our full potential, but first, we must reflect on our past, come to accept our collective flaws, and acknowledge it is human nature to seek nature as a source of happiness and self-fulfillment.

Our "national mindset" in the United States is reckless, wasteful, imprudent, and grossly disconnected from the environmental realities we face and the resources available to our global civilization. Our current modus operandi is to indulge ourselves in luxuries regardless of the impact on the equity of the

commons. We lack humility and selflessness, and our gluttonous, opportunistic mindset has led us astray. Speaking for the United States as a collective, throughout the capitalist era we have been deliberately prioritizing ourselves over all others, as is evidenced by the way our global supply chain feeds us everything we want by exploiting the world around us. This exploitation is not premeditated at the individual level, but we are all responsible for guiding the collective actions of our nation. Ultimately, we stand to benefit from making decisions based on their impacts on the whole of civilization, now and in the future.

It is likely that your current standard of living far exceeds that of most humans ever to walk the Earth. It used to be that most U.S. citizens' livelihoods were directly dependent on agricultural and artisanal pursuits. Then, industrialization reduced the need for smallholder farms and manual labor, and small-scale home and workshop trades were replaced by the mass production of factories and industrial agriculture. As local businesses were trampled by streamlined, monopolistic enterprises, local community structures were weakened. Now, the professional services, technology, and research industries have emerged, we're treading in the deep waters of globalization, and many individuals have established quite lucrative careers but feel they lack a sense of purpose and self-fulfillment because they are often far removed from simple, organic activities that support the well-being of local communities. This has left many with a greater capacity and propensity to consume more products than most humans can afford. People have lost a sense of belonging and have become excessively individuated and socially isolated, sometimes compensating for this void through consumerism or other materialistic means.

For many, today's global economic system enables a way of life wholly disconnected from the raw resource inputs and manual labor that support it. Most of the impacts from our lifestyles remain externalized beyond our attention but local impacts aside, are undoubtedly wearing down on regions outside and within the U.S. As a collective, citizens in America and other highly developed nations are capitalizing on economic and developmental disparities by exploiting the resources and labor afforded by the outside world.

Look around at everything you own and that feeds into your life. The quantity and complexity of all of the resources you consume should humble you. Your home, the furniture in it, the steady flow of fuel and electricity, the beautifully packaged products and flawless produce from all regions of the world, your textiles and apparel, and many complex gadgets and devices manufactured in the culmination of centuries of scientific and economic advancements, all support you as you sit on your royal throne. Just take a moment to appreciate all of this.

How many humans do you think it takes to support your standard of living, your hobbies, and your purchases of non-essential items? Do you feel you are productive enough and your services are valuable enough that you have earned everything around you? Do you truly feel your work, profession, and contributions to society are deserving of such compensation?

The truth is, no matter how hard one works or how much one gives to society, there is a certain threshold of consumerism beyond which no one human can justify such gluttony. The average American lifestyle is gluttonous. This gluttony is facilitated by global economic barriers enabling us to speak with our money, stand on the backs of others, and exploit poorer nations. Colonialism is not an issue of the past. Today, many nations are subject to neocolonialism, whereby external corporate interests challenge true international sovereignty.

Consider two pillars of any advanced nation—electricity and electronics. What are the raw mineral resource inputs required to support the electricity systems and the Internet of Things in the United States? The millions of miles of transmission and distribution lines and the billions of devices connected to that system in the U.S. form the largest interconnected machine on Earth.[22] This interconnected system requires enormous amounts of aluminum, iron, copper, and gold.

Headquartered in Phoenix, Arizona, U.S. mining company Freeport-McMoRan is the world's leading supplier of molybdenum, one of the world's largest producers of copper, and operates the largest reserve of gold and second-largest reserve of copper in the world—the Grasberg copper-gold deposit in Papua, Indonesia.[23][24][25][iv] The Grasberg mine was born out of the Ertsberg Mining District, which was born out of the region's social and political turmoil in the 1960s.[26][27][28] Mining in the region has led to the construction of hundreds of kilometers of roads and pipelines, cable cars, a port, a power plant, a mining town, and more. The Grasberg open-pit mining operation itself occupies an area roughly three miles wide and half a mile deep, located in the highest altitude region of the province.

Papua is not just some small, exotic place. New Guinea is the world's second-largest island after Greenland. The province of Papua, which makes up the island's western half, is larger than Freeport's home state of Arizona and hosts a population of over 4 million, including many uncontacted indigenous people. Located just a few miles from the Grasberg mine is the 16,000-foot summit of Puncak Jaya, the highest mountain peak of any island on Earth. Despite this scale, Freeport has quite literally managed to carve out and destroy the largest mountain chain in the region. Erosion, acid rock drainage, and

pollution from the operation have smothered roughly 100 square miles of land between the mountain range and the Arafura Sea, and hundreds of square miles of tropical rainforest ecosystems have been degraded.[29][30]

Individuals and organizations outraged with Freeport's impact on Papua's environment, gross human rights abuses, land confiscation and dispossession of landowners, social injustices, severe poverty due to the low share of profits going to local Papuans, and deaths caused by toxic pollution and poor working conditions, have attacked mining operations on numerous occasions, even sabotaging Freeport's infrastructure to cause millions of dollars of damage. To ensure continued operations, hundreds of people have been killed at the command of senior Indonesian military and police officers, whose military units have received millions in funding from Freeport[28][31]

What would happen if such atrocities were being committed in Arizona? Meanwhile, Freeport's CEO, Richard Adkerson, is Arizona's second-highest paid CEO, with a current total annual compensation of over $19 million—an amount dwarfed by the aggregate returns channeled to the company's shareholders[32] Each year, Adkerson 'earns' more than the combined income of a thousand of his underpaid Papuan miners. Adkerson is well aware of the many struggles of the Papuan people but avoids discussing the devastation caused by Freeport's Grasberg operations. Adkerson's indifference towards the Papuan people is evident in his own description of the Grasberg mine:

> *"It has a big impact on the environment where it's located, on communities. This mine we talked about in old New Guinea, in Papua, is 3,500 meters to 4,000 meters high, four degrees off the equator, and it rains 200 to 400 inches per year there. We have almost 30,000 people working there. We started in the 1970s, developed this massive open pit, moving some days a million tons of material a day. And now we've developed this massive underground mine, which is the largest ever done in the history of the mining industry, and we've been investing in it for over 20 years. We've invested over 10 billion dollars, we've got another 10 to spend, and we're dealing in a country like Indonesia, and in a locality in Papua where indigenous people, or… we've… you just have to learn to deal with all these things. So, I mean you have to be responsible in mining. You have to be responsible to communities, responsible to your workers. You've got to demonstrate to governments that you're not just there to take their resources away from them. You have to pay fair taxes, fair royalties, fair participation, you've got to hire local people and develop them, and so, it's a fun business, and it's a*

challenging business."[33]

You can sense how divorced he is from what the Papuan people are enduring for his benefit. Being forcibly robbed and neglected by a foreign corporation is not fun business. Losing sacred land and watching the collapse of the ecosystems you rely on for food and water is not fun business. Corporate interest and self-interest are the forces driving neocolonialism, exploitation, and undue environmental degradation. The problem lies primarily with those for whom there is never enough, who lack empathy and consider damage to the outside world and our planet acceptable byproducts of profit and luxury. Global exploitation and environmental degradation are unfortunate byproducts of greed and the aggregate planetary demands of U.S. citizens. The impacts of American infrastructure and supply chains are global, whether in the form of atmospheric emissions, land degradation, or social injustices, and our destructiveness expands beyond our stolen continent to areas we have no business disturbing. The typical American lifestyle is subscribed to the mass exploitation of foreign and domestic populations. We must reduce our impacts and emissions by transforming our system from within and controlling the corporations erected by our society.

Most of us have witnessed the smothering toxicity of smog-ridden, smokestack-filled industrial zones. The ominous, disgusted feeling you experience as the stench, noise, and appearance of an industrial district overwhelm your senses is indicative of the acute environmental damage it is causing. Most importantly, know that the more products you consume, the more we collectively consume, and the more of these industrial zones are needed to support our lifestyles, whether at home or abroad. Excessive consumption of products and resources derived from our global capitalist economy will inevitably place burdens on and degrade not just the locale, but all of the thousands of areas scattered across the planet that are home to resources on which the economic system is dependent. Ecological destruction is at the core of our current industrial system of production and is further exacerbated by growing demands. The far-reaching costs and burdens associated with this system are borne not by the elite beneficiaries of the destruction but by the communities and regions subject to the activities of corporations. As a climate warrior and an eco-warrior, you must recalibrate your soul to be satisfied with enough but no more. In a world of finite resources and limited capacity, one's opulence is inevitably another's destitution. The Earth can't sustain 8 billion kings and queens.

We Americans are Earth's environmental problem children. Limiting our gaze strictly to climate change, the true tragedy lies in the fact that we Americans,

who represent just 4% of the global population, are responsible for one-seventh of current annual global greenhouse gas emissions and roughly a quarter of total historic global emissions. And we are still failing to meet necessary emission reduction goals. Despite our economic capacity to expedite the necessary changes, we lag behind the rate of industry transformation necessary to provide less developed nations a sufficient ecological cushion as they build out their infrastructure and improve their way of life. Papua, for example, is largely 'undeveloped.' How can Papuans lift themselves out of poverty when we are stealing their resources and suppressing their demands with a militarized corporate operation? As Papua and other regions strive for a higher standard of living, the damage they have yet to do to the environment will compound the damage we have already done to it.

Developing a nation today does not require the level of emissions generated by the U.S., as much of our past emissions were 'unavoidable' because global warming was not yet of concern to the general public, and fossil fuel consumption was the most viable path forward. Regardless, excessive consumption, waste, and imprudent environmental decisions will forever scar our past and *possibly* our future. As a global economic leader among nations with the highest standards of living, we must hold ourselves accountable for the damage we are doing and have done to make it here. Americans should expect other nations to want what we have and do as we have through our development unless there is a collective global transformation with technical and financial support from wealthy, industrialized nations. America must transform itself while ensuring others don't follow in our past footsteps by helping nations decarbonize, mitigate environmental issues such as deforestation, and develop sustainably. We Americans have caused more emissions than any other nation, and it is our responsibility to spearhead this great societal transformation toward carbon neutrality and offer support to other countries.

Holding ourselves accountable for our past requires successfully regulating our corporations *and* our individual decisions, with the latter being the solution within our immediate control. We *should* maintain a focus beyond the realms of political action and corporate accountability by also looking inward. For those with individual financial stability, part of being a climate warrior is choosing not to exploit your privilege of spending power and to become more frugal while recognizing you have likely already emitted more CO2 than most other humans will ever have the opportunity to emit. We Americans have scarred the planet and carry significant emissions baggage, and with that should come some amount of guilt. You are accountable for your chosen lifestyle and are at least partly

accountable for its past and current impact on the climate and the environment. If you have been enjoying a comfortable lifestyle and haven't endeavored to reduce your footprint and engage in business and politics on behalf of our climate and all humans, then you are actively contributing to the global climate crisis. Through behavioral, political, and social inaction and indifference, we let American influence exacerbate our planetary crisis. We need broad, collective action right now.

We can drive collective climate action and cultivate personal growth as climate warriors through three realms. The first, the intrapersonal realm, is where we do our homework—where individuals become vessels of knowledge about climate change and society. We are most capable when we are informed and prepared. The second, the behavioral realm, is where we apply some of our knowledge by reducing our personal footprints and voting. We cannot disregard the low-hanging fruit. The third, the interpersonal realm, is where we engage others and orchestrate broader solutions. We can convey narratives, such as the one in this book, and effect change in others, pulling them into the heart of the climate battle—a battle of societal transformation through individual contribution. This highly contagious climate virus can be transmitted by example and word-of-mouth to create waves of climate warriors who help mitigate global warming by governing their own emissions, impacting industries, and convincing others to do the same. Truly committing to all of this requires maintaining a flame in the heart.

When you leave this precious planet behind at the end of your life, the impact of your existence will remain. You should consider your lasting mark on business, society, and those around you, and the emissions and environmental degradation attached to that mark, as part of your lifelong footprint. Theoretically, one could indirectly offset the entirety of their lifelong emissions through their impact on society and other individuals, although activism does not absolve anyone of their own accountability. You can make whole the total climate impact of your existence, for which you should be self-conscious, through actions taken throughout your life and during your career, and by reducing and offsetting your footprint. When friends and family witness your steely determination to achieve individual and society-wide carbon neutrality, they may look up to you and experience a similar feeling of ambition. They may also assume a sense of urgency and guilt. These elements of guilt, peer pressure, and an enhanced sense of urgency are necessary to fuel a social movement of climate warriors. They are also likely to underpin new initiatives to improve corporate and government accountability. **Everyone needs to accept that climate change is unlike any**

other issue we have faced as humans; that this looming catastrophe is of such magnitude it challenges the responsive capacity of technological and governmental intervention. In other words, climate change absolutely requires an all-of-the-above solution, and individual support is badly needed.

On a brighter note, there are several characteristics of the American population that, together, indicate the enormous potential for an enduring and dramatic climate change social movement, or cultural shift. I have already mentioned one characteristic, which is that during this era of weakened local community structures, individuals have a deep yearning to establish a sense of belonging. Secondly, in our modern, day-to-day lives of computerized complexity, we are deprived of adequate exposure to nature that is fundamental to humans' psychological well-being, causing a deflated sense of satisfaction and self-fulfillment, as well as a drive to reconnect with and restore the natural world. Lastly, over two-thirds of Americans are worried about climate change, view global warming as extremely important to them personally, and feel a personal sense of responsibility to help, with over half of those individuals either already taking action in some form or willing to take action.[34][35][36] These voids and characteristics suggest an imminent climate change social movement, perhaps of greater magnitude than anyone is anticipating. By joining such a movement, individuals can gain a sense of belonging, enhance their connection with the natural world, and be liberated from their paralytic state of trepidation over the future of our climate. Climate and environmental action are a holistic cure for some of American society's most pervasive ailments. Not only is a cultural shift toward sustainability necessary but it is also desired by the masses to a degree that I believe can be leveraged to transform our culture. What is needed is a deeper mobilization by those who have accepted the necessary cultural shift and see the potential for change by cultivating social pressure at the grassroots level.

The pressure is mounting for a tectonic shift in societal trends and voting patterns. If we humans inadvertently increased the temperature of our planet, imagine what we have the potential to accomplish in the opposite direction. We can get organized. Considering the magnitude of unchecked greed, gluttony, waste, and pollution in America, more attention and energy need to be devoted to informing and recruiting voters to combat those issues, while stimulating behavior change among the public. We are in dire need of effective grassroots movements that spur meaningful action.

Regarding behavior change, unfortunately, some individuals and organizations discount the potency of individual action. Some even go as far as

asserting that the net effect of promoting behavior change as a climate solution is more greenhouse gas emissions. Critics of individual action worry that by overemphasizing the need for ordinary citizens to reduce emissions through behavior change, corporations and public officials are absolved of making the rapid changes necessary to mitigate climate change. They stress that the topic of individual action is a distraction that causes the public to fixate on what they are doing wrong, thereby shifting accountability from industry to the general public and risking letting corporations off the hook. Skeptics of individual action often go beyond saying individual action is insufficient to combat climate change, sometimes expressing the cynical belief that individual action doesn't matter in the grand scheme of things. From this point of view the solution to the dire climate crisis is purely political and technological, something we can only escape using large-scale, brute-force measures, rather than something that can happen more organically. As climate change demands an all-of-the-above solution, it *must* happen more organically.

The caution exhibited by critics of individual action is understandable, but their overall message is not defensible because it treats individual action and systemic change as mutually exclusive. It is counterintuitive and counterproductive to assume a focus on individual action inherently detracts from broader political progress in some zero-sum climate solution game. Promoting individual action does not have this net effect at any level. At the macrolevel, messages promoting individual action are perceived by the public as supplemental to systemic change because these messages occur against an overwhelming backdrop of news and media coverage of climate change and the need for government policy and corporate accountability. At the microlevel, when individuals are persuaded to make changes and act, it galvanizes them into becoming more politically engaged while also having spillover effects by shifting the behavior of surrounding individuals. In other words, behavior change reduces cognitive dissonance and implicitclimate denial while building political will for climate action.[v]

Many arguments about the potency of individual action arise from inconsistent consideration of secondary benefits and the associated emissions accounting boundary. Skeptics of individual action often operate under the preconception that individual action is truly isolated to the individual seeking to make a difference. Skeptics may only be considering the mere instantaneous emissions benefit of turning off a lightbulb or the marginal benefits from other energy conservation and energy efficiency measures. These small steps do matter; they do put the individual on a path toward further action and they do have

broader social impacts. This is especially true when climate-positive habits, decisions, and actions are shared or observed beyond the household. When these actions are observed in public, by friends, at the workplace, through social media, or elsewhere, they act as a behavioral contagion and can influence political ideologies. One of the best climate-related examples of a behavioral contagion is the local adoption rates for solar panel installations. When someone installs solar panels on their home, it increases the statistical likelihood of others in their neighborhood doing the same. The effect is so significant that analysts such as me have a hard time producing accurate solar market forecasts without somehow accounting for it. Similarly, low-to-no-emission habits could become social norms with time if more of us were to adopt them. Considering the immense and growing population of environmentally conscious individuals, as well as lessons learned from solar panel adoption rates and other social phenomena, it's reasonable to believe that a behavioral contagion of climate action can spread through the population like an infectious disease, birthing a new generation of climate warriors.

Finally, regarding the broader dialogue surrounding the need for individual action, we must expand our gaze to assimilate the realities of our current situation. Consumer and behavior choices are obviously not a substitute for political action. The gravity of our situation clearly demands an all-of-the-above solution supported by ways of living that align with and reinforce climate-conscious political ideologies. But thinking our climate and environmental crisis can be solved without systemic behavior change, that the Earth can sustain 8 billion people with lifestyles and consumer appetites like that of a typical American, is out of touch with the reality of the physical limits of our planet. The truth is changes are coming and we need to be real about it and gear up for the inevitable adjustments we will have to make. We need to be prepared to equitably navigate the challenges ahead. We need to become more disciplined and responsible as stewards of the Earth.

We can also change how we prioritize things financially on the individual level. Each year the average American spends thousands of dollars on travel, entertainment, alcoholic beverages, tobacco products and smoking supplies, and other miscellaneous things not classified as essential. In 2021 alone, Americans spent over $100 billion on lottery tickets. For comparison, the Inflation Reduction Act, which is the largest climate bill ever passed by the United States, will invest roughly $370 billion in energy security and climate change programs over the next *decade*. By that measure alone, our climate efforts are outmatched by our gambling proclivity. Depending on which way you look at it, the encouraging

truth is the amount we are going to spend on lottery tickets alone this decade is enough to cover the cost of installing solar panels on nearly every home in America. We can easily afford to take massive strides toward solving climate change, but we have been misled to believe that is not the case and it is too expensive. Anything can be dismissed as expensive or not worthwhile if it isn't prioritized.

Of course, it is unreasonable to expect individuals to forego all the activities they enjoy, but some sacrifices can be made. It isn't that we *can't* make significant behavioral and financial adjustments more commensurate with the demands of our climate; rather, so many of us haven't been exposed to the social pressure to flip our climate switch from concern to prioritization. This pressure emanates from both proven and budding climate warriors. So many of us remain fixated on snatching our piece of the pie and taking seconds, knowing there are others still standing in line, rather than acting equitably and selflessly. It is our mission as climate warriors to help others see what is happening. It is our mission to encourage others to change and become meaningfully involved in ameliorating climate change. We must become influencers by raising awareness, working to transform our way of life, and remaining on the lookout for new opportunities.

Let's say we reach a critical moment of inertia, and there is a significant climate change social movement. The question then is, aside from behavior change, where will these millions of motivated individuals choose to focus their energy? My disclosure later in the book of an individual's experience as an energy policy analyst working for the State of Missouri provides what I believe is an excellent boots-on-the-ground example of a climate warrior in action. In this chapter, I briefly discussed some of the environmental and social impacts that result from our resource demands and why we must change our ways. My hope is this information and the information in the rest of the book inspire you to join others in confronting forces vying to delay progress on climate change, environmental justice, and sustainability in general.

Our capacity to overcome the climate challenge in a timely manner is greatly threatened by a myriad of entities who stand to benefit financially from delaying the necessary transformations that must occur. These entities hate the idea that the whole economy might have to change because it is currently destroying our life support system. This is happening to the detriment of all life on Earth. Humanity's greatest challenge is overcoming global warming and becoming sustainable while overcoming poverty, and if we succeed it will be the greatest feat in human history. It will mark the next phase of human civilization. True climate warriors are fully cognizant of our quickly diminishing window of

opportunity and demonstrate this sense of urgency through decisions that permeate their professional and personal lives. Global warming won't be resolved by a few gigantic solutions, but rather by millions of changes and solutions, big and small, from individuals and institutions. It is going to take long-term commitment from all of us.

To fully understand what it means to be a climate warrior, one must consider the historical characterization of a warrior: a person specializing in combat and recognized by society as belonging to a distinct warrior class. Thus, to be a climate warrior means to be recognized as a member of a distinct class of modern society respected for their sacrifices and for assuming the burden of combatting the threats that inhibit progress on climate change. These threats, although abstract relative to an ambush or an advancing army, are indeed significant and material, and in aggregate are threatening agricultural and resource supply chains, impacting health and healthcare systems, destroying infrastructure, displacing and killing millions, and generally enhancing global geopolitical risks. A climate warrior's weapons in combat are not weapons of violence but weapons of communication, wisdom, tenacity, persuasion, tactfulness, innovation, compassion, and creativity.

This is a war, but rather than defend a territory or country, we must defend a planet. Most humans do not have the luxury of dedicating the time and energy necessary to truly act as a climate warrior and impact our climate trajectory. Many less privileged individuals are already preoccupied with defending their livelihoods from the onslaught of climate change. Climate warriors are mindful of our privilege and operate with the highest levels of efficiency, intensity, focus, and compassion on behalf of everyone, including those few who fail to see what is happening to our planet.

We must mobilize because predatory delay and merchants of doubt have bullied us to the final hour in our window of opportunity to avoid a severe climate catastrophe. This final hour demands a revolution, or cultural shift, to minimize further committed warming. The stakeholders benefitting financially from causing global warming are long overdue for an intense societal push with enough force to break the nefarious, fossil-fueled, political and financial institutions into full cooperation. We are living through a dramatic transformation in human history.

As will be discussed later in the book, there does, in fact, exist a network of thousands of entities that have profit-based desires with dark implications for our planet, but their power is finite. Luckily, the degree of their control and their impact is confined to their ability to stir up conflict and pay individuals to

promote their cause. They will not be able to overcome a network of millions, if not billions, of committed individuals who deeply desire the termination of global warming. As climate warrior numbers continue to grow, our power will only be limited by the extent of our ability to communicate, collaborate, and capitalize on policy windows and other opportunities.

If you seek a higher purpose, have some spare time and energy, and want to collaborate and connect with other individuals, professionals, and climate-minded communities, then commit to the climate warrior movement.[vi] In doing so, you will become part of a larger effort. By investing yourself in the climate warrior movement, you will become a member of a special society, a fellowship, an alliance, a network, a sphere of like-minded individuals seeking to connect, unite, and make a difference. This movement to transform society is not something novel I have created. The "climate warrior movement" is simply the moniker I have chosen to refer to the past, current, and future undertakings of a growing population of deeply committed individuals. Being part of the climate warrior movement means you have joined the fight to transform society and project to the world around you that you are personally and professionally committed to contributing to climate solutions and identifying new opportunities for action. You and I, along with other climate warriors, are responsible for executing the overall objective conveyed in this book—capitalizing on all available means of accelerating emission reductions for the benefit of society. You can leverage your career, knowledge, abilities, opportunities, and connections to help effectuate change in the world around you, deploy climate solutions at scale, and mitigate specific threats to our climate.

Alongside adopting the 30 actions in this book, a climate warrior remains engaged socially, professionally, and politically and contributes to the climate warrior movement by continuously targeting threats inhibiting rapid emission reductions, such as:

- Your own personal decisions and lifestyle choices that unnecessarily contribute to your footprint.
- Individuals who acknowledge the climate crisis but neglect to assimilate this understanding into their lives by focusing on their own impact and altering their behavior in a climate-positive manner.
- Individual climate deniers (including those who are dismissive of climate change) you interact with in everyday life.
- News networks, organizations, and think tanks backed by and/or

supporting fossil interests.

- Statutes, policies, and rules inhibiting climate mitigation and adaptation at local, state, national, and international levels.
- Politicians, personalities, and other public figures contributing to climate disinformation, misinformation, and obstructionism of climate legislation.
- Corporations and industries dodging regulations, evading penalization, degrading the environment, engaging in nefarious lobbying activities, and failing to disclose and reduce their emissions and ecological impacts.
- Educational institutions and systems failing to invest adequate resources to provide sufficient and accurate climatological and societal information to children and young adults at all grade levels.

Since this list of threats is not exhaustive, you should not feel confined to combatting only these types of issues. We can collaborate and pursue initiatives, ideas, and efforts to strengthen our climate position. As an individual and a climate warrior, you should feel committed to fighting for our climate and steering our culture in the right direction, voluntarily, for the sake of all humans. The solutions to climate change are out there. It is your duty to help bring them to fruition.

[iii] *Here, an extremely high per capita emissions rate is defined as at least twice the global average.*

[iv] *Until 2018, Freeport had a majority interest in the Grasberg mine. Today Freeport owns 48.8%, as legislation was introduced in Indonesia that required foreign mining companies to divest 51 percent of their stakes in Indonesian mines.*

[v] Cognitive dissonance and implicit climate denial occur when people who have accepted the scientific community's consensus on climate change and perceive climate change as a threat fail to align their behaviors and actions with their understanding.

[vi] *You can visit the webpage for the climate warrior movement at https://www.carboncurb.com/climate-warrior-movement.*

Total annual savings from the Actions in Series 1:

290 kg CO2e

1.8% of the average American's footprint

Our planet is fluid. Even the sturdy peaks of the Rockies and Sierras are fluid over time. All of this motion, this power, is driven by molten heat deep within our planet. Geothermal energy, the largely untapped source of power lifting mountains and splitting continents, instigated the first hot bath. Hot springs have been enjoyed by humans for thousands of years. While no one knows who had the first dip, we do know Indigenous peoples used hot springs as peaceful gathering spots for several millennia. With cliff dwellings, temples, and artifacts located in several caldera regions, the ruins of these civilizations can still be visited today. The use of geothermal springs has been documented in Greece and Japan for thousands of years. Even nonhuman macaques use hot springs to relieve stress.

Humans are drawn to natural geothermal springs and to this day many embark on journeys into the wilderness seeking out primitive, undeveloped hot springs for their isolated enjoyment, relaxation, and therapy. Most people, however, are unaware of the impressive abundance of geothermal springs in the United States. Some of the hot springs have been privatized or developed into resorts. Others are so remote they have evaded disturbance and sit nestled into mountainsides awaiting the next intrepid soul. These hot springs are signposts of the power deep within the Earth. Perhaps in the future, we will leverage the vast geothermal energy resource lying underneath our homeland.

As witnessed during recent advancements in human history, our technological progress is exponential. The millennia-long captivation with hot water hit a turning point during the second half of the 1800s when Benjamin Maughan invented the "gas geyser," a gas water heater named after an Icelandic hot spring called Geyser. His patent was purchased, designs were refined, and in-home water heating systems began to take off, reaching nearly every American home by the mid-1900s.[37]

In the modern age, we tend to trivialize many things that, until very

recently, were not part of ordinary lifestyles. Today, water heating is something so many of us take for granted. Millions of personal, in-home 'hot springs' sit ready to provide us with hot water on command, emulating geothermal springs. We must not underestimate the power required for our use of hot water at home and the CO2 gas geyser associated with this relatively new luxury.

It is important to reduce both hot water and overall water consumption. Drinking and wastewater systems account for roughly 2% of energy use in the United States.[38] Most of the emissions the average American can save by reducing water consumption, however, are not from avoiding the use of water in general, but from avoiding the use of heated water, specifically.

Action 1 – Turn your water heater down to 120°F.

The average water heater in the United States holds around 40 gallons of water. The energy required to sustain a large mass of water at a high temperature year-round is significant, even if your water heater has excellent insulation. Heating water accounts for roughly 18% of the energy consumed in the average American home.[39][40] Most water heaters are factory set to 140°F (60°C), but the U.S. Department of Energy recommends lowering your water heater temperature to 120°F to save energy.[41] This is the optimal temperature because it reduces the risk of scalding and slows corrosion and mineral buildup while still staving off harmful bacteria. If you can only withstand holding your hand under the faucet at its maximum temperature for less than a few seconds, your water heater is likely set to a higher temperature than it needs to be. If the internal temperature of your water heater is 120°F, by the time the water flows through your pipes and reaches your faucet it will be slightly cooler but still above the human temperature pain threshold for sustained submersion in water, which is around 115°F.[42] So, if brief contact with the water flowing out of your sink is enough to shock you, your water heater is using more energy than necessary and, thus, is adding unnecessary carbon dioxide to the atmosphere.

There are plenty of online resources explaining how to safely adjust water heaters and accurately measure the temperature of your water. The first step is to locate your water heater. Not sure where it is? If you live somewhere that regularly experiences freezing temperatures, your water heater will be located in the building's interior to prevent frozen pipes. If it's a gas water heater, check your basement or garage. If you live in the southern U.S. and have an electric water heater, then it could be located in your attic. Attic water heaters demand significantly less energy during the summer months when the sun is beaming down, with attic temperatures often exceeding 120°F. Gas water heaters are

typically not located in attics because they require cooler surrounding air to vent properly. Still unsure? If you're an apartment dweller, you may be sharing a water heater with an adjacent unit and may need to ask your neighbor or landlord for assistance.

The second step is to find out how hot your water is. It is important to not use your hot water for at least an hour prior to testing the temperature (to ensure the water heater reaches its maximum temperature). Then, when you are ready to test it, run the faucet nearest the water heater until the water reaches its maximum possible temperature and take the measurement using a thermometer. If the water is too hot, turn down the temperature setting on your water heater and retest the temperature the next day. You can repeat this process until your water heater is set to the optimal 120°F.

Action 1 is surprisingly simple and rewarding. With a literal flip of the wrist the average American can reduce their annual CO2 footprint by 50 kg (0.05 metric tons or over 110 lbs). 50 kg of CO2 is just 0.3% of your annual emissions, but this amount of CO2 is not insignificant. To put this into perspective, this amount of CO2 occupies almost 30 cubic meters, enough to fill a large bedroom. Take note: the 50 kg of CO2 we're talking about here is just your portion of the emission reductions from making this simple adjustment. Reducing your water heater temperature also reduces the hot water consumption component of your housemates' footprints. So, for the average American household, reducing the water heater temperature will prevent over 130 kg of CO2 from entering our atmosphere, annually. Next time you are sitting in your living room, imagine it being filled to the ceiling with the CO2 you just saved by adjusting your water heater. Being a warrior means being active. Put your book down and go do this action now. It is one of the quickest and easiest actions. Just do it!

Action 2 – Insulate your water heater and hot water pipes.

Now that you have familiarized yourself with the energy consumption of your water heater, you might find it easier to believe that insulating your water heater and the hot water lines leading out from it can also result in noteworthy carbon reductions. Similar to sleeping with a blanket at night, insulating your water heater will reduce heat losses, saving you both energy and money. If your water heater is new, it may already have sufficient insulation built into it, with an 'R-value' of at least 24 or greater. Otherwise, there are various water heater insulation options available for around $30. Keep in mind you will need to ensure your chosen water heater insulation blanket will work for your specific water heater size and model. Be sure to follow the installation and safety instructions

that come with your chosen insulation blanket. Installing insulation on the hot water pipes is a little more straightforward.

When you add additional insulation to your water heater, you may need to further reduce its temperature setting to compensate for the improved insulation and to fulfill the 120°F requirement of Action 1. If your water heater and hot water pipes don't already have sufficient insulation, completing Action 2 will easily save enough energy to recover the one-time cost of a water heater blanket and other supplies, as well as the embedded emissions associated with manufacturing the insulation materials. For the average American, the annual personal emission reduction from completing this Action is 30 kg of CO2, or 0.2% of their annual emissions.

Action 3 – Install low-flow faucet fixtures and conserve water.

You can reduce your footprint by reducing the flow rate of your shower and bathroom faucet. This will result in reduced emissions from decreased water consumption, but more importantly, decreased hot water consumption. You can use a gallon or half-gallon container and a timer to determine the current flow rates of faucets and showerheads in your dwelling. If the output of your shower is 2 gallons per minute (gpm) or more, you should replace your current showerhead with a low-flow showerhead. A low-flow showerhead allows less than 2 gpm of flow. However, showerheads are even available at less than 1 gpm. Additionally, check to make sure your bathroom sinks allow less than 1 gpm of flow. 0.5 gpm of flow is plenty for bathroom sinks, and there are faucet aerators available at less than 0.5 gpm. Don't forget to turn off the tap while you brush your teeth!

There are several things you can do to reduce water consumption in the kitchen. Ensure the fixture for your kitchen sink isn't dumping your money down the drain by measuring its flow and installing a new fixture or aerator rated at 1 gpm or less, if necessary. You can also save water by breaking bad habits, such as leaving the water running while you scrub dishes. You can further reduce your hot water consumption in the kitchen by acknowledging that your dishes don't always need hot water. I have given up the use of hot water in the kitchen altogether, and my dishes are just as clean as they were before I broke the hot water habit. Many common dishwashing liquids effectively sanitize your pots and pans using cool water. You can also adopt dietary and cooking habits that minimize the number of greasy dishes produced. Drink from the same cup several times before declaring it dirty to reduce the frequency with which you need to do dishes. Try to optimize your water usage by becoming more systematic.

Another kitchen hack is to pay attention to the orientation of the faucet handle and ensure it is in the cold position when you're using water that doesn't need to be hot. Unfortunately, it is not uncommon for the most ergonomically convenient faucet handle position to be the hot setting. Many households are constantly tapping into their water heater for mundane tasks, such as soaking a rag, a quick hand rinse, and more. These incremental uses of water with the faucet lever in the wrong position unnecessarily pull hot water from your water heater, wasting energy as the hot water never reaches the tap and is left to cool in the pipes. This is not just an issue in the kitchen. Bathroom faucets that have single handles can be angled to draw hot or cold water. It is, in my opinion, totally unnecessary for there even to be a hot water connection to the bathroom faucet. I can't think of one time I've needed hot water from my bathroom sink. Cold water is perfectly fine for brushing teeth, washing hands, shaving, and a quick splash to the face.

Even if you adopt all the water- and energy-saving recommendations mentioned above and avoid pre-rinsing your dishes before loading them in the dishwasher, you may still use some hot water in the kitchen for washing greasy pots and pans among other things. This is especially true if you don't have a dishwasher. An effective method of reducing hot water consumption while washing dishes is to first use the sprayer to blast most of the grease and debris off of pots and pans with cold water. Then, put about a nickel-sized amount of soap on the coarse side of the sponge. Let this sink into the sponge, then slowly drizzle some water on top of that until the entire sponge is saturated to disperse the soap throughout the sponge. This will gradually release the small amount of soap and water you need as you clean your dishes. The water should be off the whole time, except for the few times you turn it back on to saturate the sponge again. As you are scrubbing your dishes, set each sudsy dish to the side momentarily prior to rinsing. After you have scrubbed everything, turn the water on low and *quickly* rinse all of your dishes at once, using as little water as possible. Another water-efficient method of washing dishes is plugging the drain, filling the sink with water one time, and scrubbing and rinsing all of your dishes in that water. You may prefer this method to the previous method because you can be certain of the amount of water you use. In general, scrubbing pots and pans immediately after they are used before the food particles and residue begin drying on your dishware, will make the whole task of cleaning easier, quicker, and more water-efficient.

By reducing your hot water consumption through a combination of installing low-flow fixtures and aerators and developing habits that are mindful of

hot water consumption, you can reasonably reduce the amount of energy your water heater uses for non-standby load by roughly 40%.[43][44][vii] As with Action 2, the energy savings that will result from you completing Action 3 will more than offset the one-time cost of purchasing a showerhead or aerator. Completing Action 3 will save you roughly 110 kg of CO2 (0.7% of your annual emissions).

Action 4 – Take cool showers. Scrub with the water off.

The average American's shower lasts 8 minutes and uses over 2 gallons of hot water every minute.[45] From a climate warrior's perspective, the long, hot shower is a carbon beast that must be slayed. At a minimum, you can practice reducing time spent in the shower by using a timer or alarm to limit your showers to five minutes or less. You can also drop any unnecessary habits that waste a lot of water, like brushing your teeth in the shower. To save the most energy, you can take cool showers and turn off the water while you shampoo, scrub, and shave. I don't even wait for the water to get hot. I turn on the shower, *quickly* soak myself in cold water, and then turn off the shower. With the water turned off, I get my whole body sudsy and then when I'm ready I turn the shower on to *quickly* rinse. The cold water makes the soaking and rinsing process a lot quicker!

Energy isn't the only concern when taking hot showers. The truth is hot water is unhealthy for your skin because it dries it out, causes damage, and promotes bacterial growth, increasing your chances of infection and causing your skin to overproduce oils. Aside from the benefits for your skin, there are many other physical and psychological benefits from taking cold showers.[46] The colder the better, but if you can't handle it, your showers don't *need* to be ice cold; just taking a cool or tepid shower will have an impact. If you find it hard to reduce the temperature of your showers, consider showering immediately after you exercise, as hot water will seem less appealing when your body temperature is elevated and the surface of your skin is cool from evaporating sweat. Lastly, baths generally require more hot water than showers. Stick to showers to reduce your footprint and save baths for very special occasions.

Action 4 is about reflecting on your hot water usage, rethinking the 'need' for hot water itself, and identifying ways to limit it. Do it for your skin and for the planet. By using cool water in the shower instead of hot water, and scrubbing with the water off, Action 4 will save the average American 100 kg of CO2 annually, or roughly 0.6% of your total annual footprint. This amount of CO2 occupies the same volume as two school buses. That is absolutely worth a few goosebumps!

Climate Warrior Stretch Goal: Always shower and wash dishes using water at the coldest temperature possible and shut off the water while scrubbing.

[vii] Standby load is the energy your water heater uses to maintain its set temperature when no hot water is being used.

Let's shift our focus from personal changes to reduce your emissions back to broader climate issues. It is vital that we become more engaged as a collective so we can make progress on climate change across the fabric of our society. Society is, of course, dependent on the services provided by businesses across many industries. Within each industry there is a spectrum of corporate behavior, ranging from organizations spearheading climate solutions to the laggards who deliberately avoid or inhibit climate solutions. When a laggard controls the supply of a basic resource necessary to fulfill basic human needs, such as electricity, where does this leave individuals seeking to reduce their environmental impacts?

Many of us don't think much about our access to electricity but depending on where you live, your local electric utility may be making a concerted effort to delay transitioning to renewable energy and reducing its emissions. With all the industry jargon, bureaucratic fog, and deceptive greenwashing, it is not readily apparent which entities are the bad actors and which regulatory bodies have been compromised or are falling short of delivering emission reductions. These issues are largely hidden from the public because the burden of accessing the available information can be extremely convoluted and tedious. There is a big learning curve when navigating public utility commission document filing systems and understanding how to interpret information filed by electric utilities. This is often intentional, but it is unacceptable, as the public needs to be aware of these issues given their direct connection to our lives and implications for our future. Unfortunately, the general public is largely unaware of what is going on in the energy sector in their region, including how their own electricity provider operates.

I used to be unaware. I lived in Missouri during my undergraduate studies and after earning my master's. I became an expert on the nexus of climate change and society. Yet I was oblivious to the global climate implications of energy policies in Missouri and other overlooked states until I came to know a hardened gentleman who for the purposes of this book goes by the name Walter. Walter had established a career in the energy sector and was working as a state-employed energy policy analyst in Missouri's regulated electricity market. During that time Walter became aware of Missouri's broken system and wound up deeply involved

in the tornado that is Missouri energy politics.

Here I will disclose Walter's personal account of a dramatic series of events and unveil the global significance of failing to enforce policies that reduce the outsized greenhouse gas emissions generated by Missouri and a few other overlooked jurisdictions. This story strikes at the heart of the coal industry and demonstrates the interwovenness of recalcitrant fossil interests and systemic socioeconomic issues plaguing certain regions of the United States. Many solutions are worth fighting for on climate battlefronts across the U.S. and other nations. I hope this story will galvanize you into action and serve as both a lesson and inspiration for prospective climate warriors. For many reasons, I consider this chapter the most deeply intertwined with the core of this book and the greater message I seek to convey.

As a past public servant who worked for the citizens of the State of Missouri and beyond, Walter considered it his duty to disseminate information concerning a fraud he uncovered involving the electric utility that is arguably the North American coal industry's single most important customer. Walter resolved to share his story through this exposé. Under the direction of a woman with deep ties to the coal industry and the Trump administration, state officials capture[viii] to Ameren Corporation opened an investigation into Walter's involvement in the effort to hold Ameren accountable for fabricating counterfeit renewable energy certificates, deceiving the public of its use of renewable energy, and failing to comply with Missouri regulations.

The public should be more aware of Missouri's capital's unprofessional and often corrupt work environment. Energy and environmental regulation in Jefferson City, MO are lagging far behind other states and nations because of the corporate stranglehold of utility and energy companies on our public servants, as well as the influence these corporations have on citizens in rural areas who are more easily swayed by targeted disinformation and misinformation campaigns. Supported by shareholder interests, Missouri's significant political barriers safeguard an entire industry. If these barriers are dissolved more swiftly, it could have a cascading effect that alters regional emissions trajectories by expediting the ongoing collapse of the North American coal market. Before I explain how this is possible, I'll provide a backdrop for the unfolding drama.

This book has already discussed the sheer magnitude of society's greenhouse gas emissions. A large share of the United States' and Missouri's total emissions are attributed to coal combustion for electricity generation. Most coal-fired power plants in the U.S. are several decades old, with an average age of nearly 50 years.[47] Many of these facilities require costly maintenance and repairs

and are due to be replaced.[48] Despite opposition from the public and the need to mitigate climate change, many electric utilities opt to run their coal plants into the ground, even if it risks operating at a loss. The electric utilities making these decisions are in the minority however, as most companies are accelerating the retirement dates for their coal assets to reduce their emissions and operating expenses, appease customer demands, and meet society's needs. **It is crucial that electric utility companies retire their coal plants as soon as possible because phasing out coal from the electric utility sector is the most immediately achievable and cost-effective large-scale technical solution to dramatically reduce CO2 emissions in the United States**. This phaseout is well underway, but it can be expedited for the benefit of all.

It is easy to take electricity for granted and remain unaware of the sources of energy we use at home every day. Much of the electricity I used while typing these words was transmitted from coal-fired power plants. Mountains of earth were converted into flowing electrons, enabling me to power my computer and create this book. You and I, and electric utility companies, are customers in the vast coal supply chain, but where is all this coal coming from?

A great deal of our coal is mined in Wyoming. West Virginia has quite the reputation, but the Powder River Basin in Wyoming is the epicenter of coal mining in the U.S. The surface mines we source our coal from in the Powder River Basin are unlike others due to their immense scale. These truly monstrous operations have formed colossal scars on the surface of our planet that can be seen from space with the unaided eye.

In 2021, 44% of the coal produced in the U.S. came from the Powder River Basin in northeastern Wyoming.[49] Just two companies control most of the Powder River Basin coal production. The mines owned by Peabody Energy Corporation (Peabody) and Arch Resources, Inc. (Arch) collectively produce 60% of the coal that comes out of the PRB.[49] Combined, Peabody and Arch's PRB operations alone fueled 12% of the electricity generated in the U.S. in 2021, or roughly 1% of electricity generated globally, and accounted for 16% of total electricity sector emissions in the United States.[2][50][51][52][53][54] Peabody is the world's largest private-sector coal company and owns the largest coal mine in the world, the North Antelope Rochelle Mine in Wyoming's Powder River Basin. Arch owns the next largest mine in the U.S., the Black Thunder Mine, located adjacent to Peabody's North Antelope Rochelle Mine. Despite the U.S. District Court for the Eastern District of Missouri granting the Federal Trade Commission's injunction that barred Peabody and Arch from creating a joint venture out of their Wyoming coal mining complexes, satellite imagery shows the

North Antelope Rochelle and Black Thunder mines are now physically connected, enabling the companies to combine resources[55] Peabody and Arch pursued the joint venture to strengthen coal's competitiveness with other energy sources and create value for stakeholders in the struggling industry.

Coal-fired electricity generation has been steadily declining in many regions as corporations and nations turn to cheaper energy sources and seek to reduce their emissions. Because of this, coal consumption in the U.S. today is half of what it was a decade ago. For the past several years, operations in the U.S. coal mining industry have been defined by bankruptcy filings, corporate mismanagement, asset liquidation, and callous disposal of employees as companies lose their shaky footing through the current coal industry slide. Most of the industry has gone bankrupt. Some mining companies recovered, but some are still bloated on the balance sheet. The entire industry is experiencing pressure from banks and other lenders, and sustaining capital has become difficult due to the many challenges across the coal mining space. No one is willing to invest in a new thermal coal mine in the U.S. because there is no outlook for the market and little likelihood of getting a return on capital. The movement of the electric utility sector away from coal is causing the industry to continue stepping back. Coal miners see what lies ahead, and thus, the industry has a high rate of attrition. Miners are pivoting away to sustainable industries where they have a stable future. The coal industry is collapsing, and the mechanics of this collapse are important to grasp.

When an electric utility retires a coal-fired power plant, it has a permanent, broader effect on coal markets. Certain economic theories do not apply to the coal industry because of its uniquely inflexible physical and financial characteristics. Established thermal coal mines became economically viable many years ago. They maintain profitability through long-term contracts with customers (primarily electric utility companies) whose guaranteed consumption gives mining companies confidence they will recover the capital invested to establish and sustain mining and transport infrastructure, as well as the equipment and workforce supporting it. The initial financial and technical hurdles involved in expanding coal production are so great, today's U.S. coal industry can only move in one direction—retreat and shrink. When a coal-fired power plant closes, one or more coal mines lose an important contractual customer. This is analogous to tightening a ratchet mechanism. Once the decision has been made, the mine is locked into a future of lower revenue. The mine owner must adjust by raising coal prices or by permanently abandoning assets and personnel to maintain profitability.

This applies to operations in the Powder River Basin. For each major customer that terminates contracts or reduces Powder River Basin coal purchases, future coal contract prices must increase, or the mining companies have to liquidate assets and lay off employees to remain profitable. Production from the Powder River Basin region will continue to struggle as coal is phased out of the electric utility sector. As this phaseout occurs, the cost of mining operations will be spread over increasingly fewer customers—the remaining power plants and industrial facilities subscribed to these mines. As contracts expire and new contracts must be renewed, those remaining electric utilities may not be willing to absorb the price increases and may decide to expedite closure dates for their coal power plants due to the increasingly favorable economics of renewable energy technologies.

In other words, close a coal-fired power plant now and the rest may close sooner. This positive feedback loop can be enhanced using a variety of political and regulatory mechanisms to pressure individual electric utilities in specific states to retire their coal assets. **These mechanisms can be deployed prescriptively to pressure the primary customer base of individual mines and affect the profitability of key mining complexes**. These mechanisms include but are not limited to updating and enforcing state renewable portfolio standards, strengthening pollution control and reporting programs, engaging in communication and public awareness campaigns, building legally binding agreements and goals into utilities' integrated resource plans, pushing for accelerated retirement of fossil power plants in utility rate cases and energy efficiency planning processes, and establishing fuel charges, carbon prices, or emissions limits. All of these mechanisms, along with voluntary efforts from companies, pressure from the general public, and availability of cheaper energy sources, are a vise clamping down ever tighter on the coal industry. Occasionally, the industry buckles and is forced to readjust.

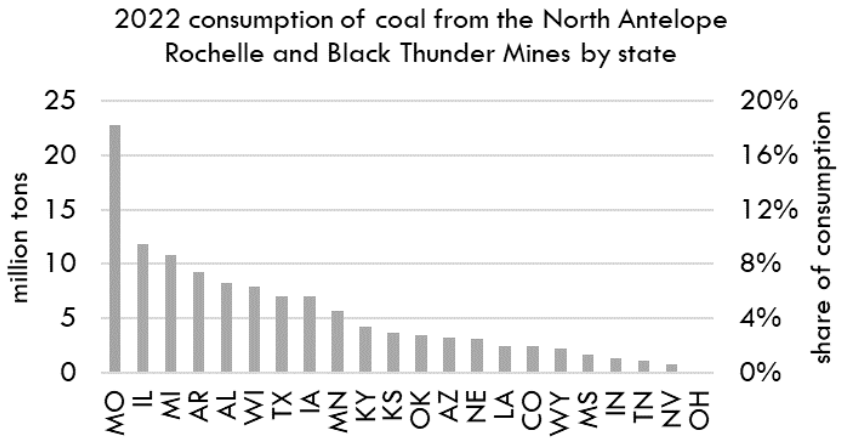
Through all the turbulence of the past decade, Peabody and Arch remain in control of the majority of Powder River Basin coal production and therefore are likely to maintain firm control of a significant share of total U.S. and global coal production for years to come. Many coal mines, including some of the Powder River Basin mines, are vulnerable to power plant closures by electric utility companies. Peabody's North Antelope Rochelle Mine and Arch's Black Thunder Mine, however, are likely to outlive the other mines because of their immense scale and comparatively broad customer bases. Each of these mines serves several dozen power plants, whereas other mines with higher customer-base risk supply coal to only a few individual power plants or less.[56] In 2022,

the North Antelope Rochelle and Black Thunder mines alone supplied 26% of all U.S. coal.[57] Much of this production will be sustained unless there is an intervention. **Long-term strategies to improve the United States' emissions trajectory will need to involve aggressively targeting the customer bases of the North Antelope Rochelle and Black Thunder mines, specifically**. Missouri is arguably the best place for us to focus some of these efforts. We can curb nationwide emissions to support international needs by continuously pushing the largest customers of these coal mines toward renewable energy resources.

Despite having a customer base comprised of over 50 companies, in 2022 just five electric utility companies made up one-third of the demand for coal from the North Antelope Rochelle and Black Thunder mines. The following table shows these top five customers listed in order of the amount of coal purchased from the North Antelope Rochelle and Black Thunder mines in 2022.

Amount of coal purchased from t Rochelle and Black Thunder		
Electric utility company		
Ameren Missouri (Union Electric Co.)		
Associated Electric Coop, Inc. (AECI)		
Alabama Power Co. (The Southern Co.)		
Consumers Energy Co. (Consumers Energy)		

Of these five companies, the top two are located in Missouri, with Ameren's 12 million tons alone accounting for 10% of all coal produced by the North Antelope Rochelle and Black Thunder mines in 2022. In total, there were ten power plants in Missouri sourcing coal from these mines in 2022. Looking at total state consumption of coal from the North Antelope Rochelle and Black Thunder Mines, Missouri stands out from the pack with a 19% share in 2022, having received roughly 23 million tons of coal shipments from the two mines. In second place, with a 10% share, is Illinois, Ameren's other operating territory. This information is shown in the figure below.



Most of the largest coal-fired power plants in the U.S. are in states with government-sanctioned electric utility monopolies. The geographic distribution of these coal-fired power plants bears resemblance to a political map of the U.S., with more being located in Republican-controlled states. Because of the regulatory environments in some of those states, utility companies that own these power plants are often insulated from market forces. This enables certain electric utilities to operate in ways that defy public interest and might otherwise not be viable in truly competitive markets. The public can intervene to influence these companies' decisions and pressure them to retire their coal assets. **Missouri is the most lethal state to begin targeting the electric utility customer base of the North Antelope Rochelle and Black Thunder mines**.

Both Peabody and Arch are headquartered in St. Louis, MO. As of 2022, looking at the two coal companies' combined sales, their largest customer was Ameren Missouri (Union Electric Co.), also headquartered in St. Louis. Also in Missouri, Associated Electric Cooperative, Inc. (AECI) and Evergy, Inc. were the third and seventh largest customers of the two coal companies, respectively.[57] Historically, roughly 80% of the electricity generated in Missouri has used coal as the fuel source. In 2021, 75% of Missouri's electricity came from coal, primarily coal from the Powder River Basin in Wyoming.[58]

Missouri makes up several vertebrae of the backbone of the declining North American coal industry. The state is home to a dying industry fighting for survival and willing to do just about *anything* to protect itself regardless of the impact it has on individuals and Missouri's entire economy. Missouri citizens are victims of one of the largest and longest-lasting disinformation campaigns in history, aimed at prolonging the use of fossil fuels and hiding the urgency of the climate crisis. Stakeholders backing this propaganda have deep federal

connections, spend millions of dollars lobbying for regulatory and tax breaks, and have successfully received special treatment. This federal connection has been demonstrated in several instances, including during the visit of EPA Administrator Scott Pruitt, Senator Roy Blunt, cooperative executives, and GOP officials to AECI's coal-fired Thomas Hill Energy Center in 2017. This was Pruitt's first visit to a power plant as the EPA Administrator. Pruitt proclaimed from a podium that "the war on coal is over; the war on fossil fuels is over."[59] [60]

If you are among the hundreds of thousands of individuals served by one of the 51 local electric cooperatives receiving electricity from AECI, remember that cooperatives like AECI are owned by all of their member customers and operate under a form of bottom-up governance. Your co-op is a not-for-profit, independent business accountable only to you and the other local people it serves. Theoretically, you have some authority in determining how your electric utility operates. You can organize with members of your community and surrounding communities, leverage municipal support, and influence AECI. You can vote in the Board of Directors elections and on other issues. Peabody and Arch, and their affiliated entities, want you not to acknowledge what is happening to our planet and even ignore the health impacts of coal combustion on your community because so long as that is your disposition, they can keep delivering coal to places like the Thomas Hill Energy Center while pretending there is unwarranted political mistreatment occurring that disproportionately affects coal companies.

Electric utilities provide a basic need for society and can alter the social fabric of the localities they serve. Often, what is ideal for the long-term relationship between an electric utility and a coal mining company is extremely damaging to those affected by their operations. This false notion exists that fossil fuels are a limitless source of health and prosperity for local economies. As society advances and replaces outdated industrial structures, certain states are uniquely positioned to capitalize on the renewable energy and green tech boom, and some are failing to leverage those unique positions. As society continues to transition away from coal, the economic impacts are evident in Wyoming and Missouri, among other states.

Out west, Wyoming's economy is closely tied to the energy sector. Ironically, the region with the fastest annual average wind speed is adjacent to the greatest coal resource in the United States—the Powder River Basin. Southeastern Wyoming has the most powerful wind energy resource in America. [61] The wind industry is growing rapidly and so are the economic opportunities

that come with it. Layoffs and unemployment from the decline of the coal mining industry are undoubtedly already impacting and will continue to impact the citizens of Wyoming. On the bright side, should the citizens and leaders of Wyoming effectively capitalize on the renewable energy boom, they could reap far greater benefits from their wind energy resource than coal can provide in the decades to come.

The renewable and clean tech industry in Wyoming, particularly wind energy, has the potential to create more employment opportunities than will be lost as coal production ramps down in the PRB, ultimately resulting in a stronger economy after coal is phased out. In contrast with the "we promise we'll share" economic concept sold by the fossil fuel industry and other highly monopolistic industries, wind farms remove the reliance on 'trickle-down' economics. The wind industry naturally benefits local Wyoming citizens due to the distributed nature of wind turbines and their construction, long-term operation and maintenance requirements, and established industry norms for easement, property leasing, and tax agreements that provide significant revenue streams to private landowners and small communities.

Citizens of Gillette, Wright, Douglas, Casper, Cheyenne, Laramie, and elsewhere in Wyoming, many of whom Peabody and Arch have discarded, have valuable technical skills that quickly transfer over to the wind industry, where they can establish a career guaranteed to last for decades to come. This longevity is not possible in the Powder River Basin mines. Just across Wyoming's southern border in Colorado are the National Renewable Energy Laboratory, Fort Collins, Boulder, Denver, and an expansive population of Americans who would love to consume more Wyoming wind. Wyoming has a future in wind energy. Transitioning from a state that exports coal to a state that exports wind can do nothing but improve the state's outlook.

Meanwhile, Missouri imports vast amounts of Wyoming coal and other fuels. In fact, Missouri imports virtually all the fossil fuel it consumes. As opposed to other states that produce much of their own energy resources, the energy sector currently costs Missouri at least 4% of its state GDP.[62][63] In Missouri, the energy sector functions as a wealth extraction mechanism. Missouri has a subscription to out-of-state energy resources, transferring wealth from local Missouri communities to distant economies and energy company shareholders with each unit of energy consumed. Renewables should be particularly appealing in Missouri, which has no fossil fuel resources but considerable wind, solar, and hydro resources.

In Missouri, investor-owned utilities such as Ameren are regulated by the

Missouri Public Service Commission. Electric utilities are required to regularly submit to the Public Service Commission long-term, 20-year plans called integrated resource plans. These extremely rigorous plans outline how each utility intends to operate over the coming decades. Electric utilities in Missouri have historically omitted climate information from their integrated resource planning processes, with little or no mention of their impact on the climate or the effects of climate change on their load forecasts and transmission and distribution infrastructure.

To avoid a global climate catastrophe, corporations in developed nations need to reach net-zero carbon emissions by 2050 and halve emissions by 2030.[64] Until quite recently, Ameren, Missouri's largest electric utility, had not acknowledged the urgency of the climate crisis in its long-term plans and intended to rely mostly on coal-fired generation approaching midcentury.[65] In September 2020, Ameren announced a step change, finally yielding its long-held stance on climate change.[66] Ameren has changed its policies and attitude in some ways, but continues greenwashing to delude customers and prospective investors of the company's past and current devotion to the coal industry. With its legion of lawyers and outsized political power, Ameren has long maintained its abusive control over Missouri, where recalcitrant business interests and legal structures have forced regulators into a submissive state of indifference. Missouri's government currently has limited capacity to regulate its energy companies, and many irrational decisions have been and are being made behind the scenes because of pressure from these companies.

Peabody, Arch, Ameren, and the other electric utilities' reluctance to change has damaged Missouri's economy. Despite having relatively low electricity rates, Missouri businesses have fled to other states, and the state has become economically stressed. One major reason Missouri is having difficulty attracting business today is that large corporations have their own climate and emission reduction goals which can't be met if they locate themselves in Ameren's territory or other coal-intensive regulated utility territories. Corporate climate goals are driven partly by shareholders and partly by the employees of those companies. Fossil-derived electricity does not attract a young, talented workforce. To compound the matter, states choosing to sustain vertically integrated, coal-addicted electric utility monopolies are generally Republican-led and have a proven propensity for adopting other policies that are unappealing to younger generations. Missouri's deep red, government-sanctioned, coal-addicted, electric utility monopoly system is unattractive to the incoming workforce and modern business landscape in America, which has transitioned from a manufacturing

economy to an economy based primarily on services, technology, and information. Apple, Microsoft, Tesla, Amazon, Google, Meta, other major companies, and a growing number of smaller firms have climate goals incompatible with what Missouri can provide, so they choose to locate themselves elsewhere.

In today's modern, climate-conscious society, areas where coal's roots remain strong are experiencing stunted economic growth, increased political divisiveness and violence, and sustained institutional racism. The politicization of climate change has caused the climate denial narrative to become a core ideology of segments of the population more susceptible to ignoring existing racial divides and injustices. This has led to further redistricting to favor fossil interests, thus exacerbating preexisting social issues to the disproportionate detriment of low-income and minority populations. Not only are these unheard populations left with diminished voting power, but they must also confront greater economic challenges, greater social challenges, and, inevitably, higher occurrences of crime than the rest of the population. These issues can tarnish a city's reputation and repel business, and are perhaps another reason why St. Louis, which has the highest murder rate of any major American city, continues to struggle.[67] St. Louis used to be an oasis of company headquarters. What once stood as a global symbol of boundless growth and opportunity, the Gateway Arch (aka the "Gateway to the West") now towers over a declining city and two declining coal companies.

In Missouri's capital, Jefferson City, there are politicians walking around wearing ankle holsters and metaphorically shooting themselves and their fellow citizens in the foot by making near-sighted decisions. When handling global issues, such as COVID-19 and climate change, the Republican platform in Jefferson City, MO and others like it can be toxic and outright counterproductive. The pecking order is crystal clear in Jefferson City. Adjacent to the Missouri Governor's mansion is Ameren's capital building. Two doors down is the Missouri Petroleum Marketers & Convenience Store Association. Governor Parson is figuratively in bed with and physically sleeping beside the energy sector. Adding to the beauty and poeticism of the love affair, the Governor's mansion and Ameren's building experience the incessant rumble of coal deliveries passing by on their northern side on the Union Pacific Railroad, used by Peabody's North Antelope Rochelle Mine. Oh my, how things come full circle.

Within the energy sphere of Missouri state government, the leadership style is currently fascist by some measures, with blatant examples of a political dictatorship willing to discipline or terminate employees expressing concerns or

interests that don't align with those of energy companies. The philosophy of the Missouri Public Service Commission, the body charged with regulating utility companies to serve the public, has changed over the past several years to defy even its name. Public Service Commission staff often opt to remain silent during stakeholder meetings when other parties raise legitimate environmental, economic, or climate-related concerns that oppose or are in misalignment with the objectives of Ameren or other electric utility companies.

The Public Service Commission has five Governor-appointed Executive Commissioners with an undersized staff operating underneath them. It is relatively cheap and easy for energy companies to gain control of the energy regulatory landscape since all of the leaders in state government who make the major decisions—decisions that determine whether and to what extent policies are enforced—are not required to be appointed based on merit but are often appointed based on relationships and whether or not the necessary political ideologies are in alignment. It is likely that Ameren's clout directly impacts determinations of who the appointed Executive Commissioners will be or who might become the new director of a department or division.

The late Carol S. Comer was named Director of the Missouri Department of Natural Resources in 2017. She dictated the state's environmental efforts including the pollution control and permitting programs. Before being appointed by the Governor as Director of the Department of Natural Resources, Comer served as the Commissioner of the Indiana Department of Environmental Management, working directly under former Governor and Vice President Mike Pence. Comer reported directly to Pence and controlled how environmental regulations were implemented and enforced in Indiana. During the transition between the Obama and Trump administrations, Comer was considered for a high-level appointment in the Trump administration as Administrator of the EPA. Although she didn't end up in that role, connections and ambitions likely remained.

When Comer started at the Missouri Department of Natural Resources, Missouri had more than 2,000 expired environmental permits held by businesses that are required to comply with various environmental standards. That backlog was reduced by more than 80% by working with permit holders to develop "practical" requirements, as Comer would say, that provide for a "healthy" environment.[68][69] It is no surprise that these "practical" requirements allow for nonattainment areas[ix] in Missouri, as well as allow facilities to continue emitting pollution at levels beyond legal or healthy limits.[70][71][72] The State's requirements for testing for contamination are so minimal they are detrimental.

Combined, Governor Parson and Director Comer made quite the team and appeared to be comfortable allowing certain power plants and industrial facilities to continue spewing unhealthy levels of contamination. This influences the health of people well beyond Missouri's borders, directly affecting air quality in several other states, and impacting the global climate. Furthermore, since coal-fired power plants in Missouri are located on the Missouri and Mississippi Rivers, toxic materials from coal ash waste stored in the flood plains of our nation's two primary rivers contaminate the waters and make their way down to the Gulf of Mexico where they bioaccumulate in the food supply and affect the diets of millions of Americans.

As the Director of the Department of Natural Resources, Comer was a member of the Governor's cabinet and advised Governor Parson on environmental matters and energy policy. Together, they made the decision to move the Missouri Division of Energy, the division where Walter worked, from the Department of Economic Development to the Department of Natural Resources in 2019. They then terminated the highly qualified, incumbent Director of the Division of Energy without notice and appointed a new Director with no energy experience other than managing a few of his own gas station convenience stores a decade prior.[73] He was remarkably underqualified to run the Division and was eventually fired in 2023 due to internal concerns and complaints regarding his incompetence and inability to manage the Division. He and Comer, and other leaders in government such as the Commissioners of the Public Service Commission, were quite possibly appointed specifically to impede enforcement of existing environmental regulations and efforts to reduce emissions and mitigate environmental issues in Missouri.

One example of this involves Ameren's renewable energy credit fraud with WestRock, which enabled Ameren to evade compliance with the statutory requirements of Missouri's Renewable Energy Standard. Missouri is among 30 states with renewable portfolio standards, which require electric utilities to procure a certain amount of renewable electricity. In Missouri, the requirement in 2019 and 2020 was that 10% of utilities' total electricity supply had to be derived from renewables, either in the form of their own generation, through purchasing electricity, or by purchasing renewable energy credits, also known as renewable electricity certificates, which can be banked and used up to three years later. Missouri's statutory requirement for renewable electricity increased to a modest 15% in 2021.

While Walter was serving as an energy policy analyst at the Missouri Division of Energy, he discovered Ameren Missouri (Union Electric Co.)—the

largest customer of the largest private coal company in the world (Peabody Energy)—was using fraudulent renewable energy credits to meet Missouri's Renewable Energy Standard requirements. Although Ameren had made a very bold and reckless executive decision, Walter didn't view Ameren's actions as remarkably surprising given their track record and relationship with the coal sector. The 'renewable energy credits' claimed by Ameren were procured from the Fernandina, Florence, Hodge, and Panama City paper mills located in the Southeastern United States and owned by WestRock, a Fortune 200 company and America's 2nd largest packaging company operating a fleet of pulp and paper mills across North America.

For a portion of Walter's time at the Division of Energy, he was included in the review process required for certifying certain facilities as "renewable," as it is defined in Missouri's statutes. Had he not been, he likely would not have known about the Ameren-WestRock issue. The Division of Energy's renewable certification indicates nothing more than a facility has been determined to, whether for a fraction of that facility's operations or for the facility's operation as a whole, meet the criteria to be defined as a potential source of renewable energy eligible for Missouri electric utilities to use to comply with the Missouri Renewable Energy Standard. The Division of Energy's renewable certification is merely a supplementary requirement that is not part of the obligatory processes of evaluating, measuring, and verifying actual quantities of renewable energy credits generated at a facility, which are carried out by third-party verifiers, professional engineers, qualified reporting entities, the administrators of the renewable energy credit tracking systems, and, most importantly, the Missouri Public Service Commission.

The energy produced at WestRock's paper mills is a byproduct of fossil fuel consumption and the kraft pulping process. Wood chips are fed into digesters and cooked in an acid solution, called "white liquor." This dissolves the lignin that binds cellulose fibers together in wood and separates the plant fibers to produce pulp. When cooking is complete, the spent cooking liquor is separated from the pulp. The pulp is washed and sent through other processing systems to be turned into a finished paper product. The spent cooking liquor and the pulp wash water are combined into a solution referred to as "weak black liquor." Evaporators are then used to remove moisture and concentrate the black liquor until it is comprised mostly of solids. The resulting "strong black liquor" is then fired in recovery furnaces to recover the expensive inorganic chemicals present in black liquor. The remaining organic materials dissolved in the black liquor are combusted to provide heat for generating process steam. This energy powers

ancillary systems in the mills, but mills typically require more steam than can be provided by the recovery furnace, so boilers that burn coal, oil, or natural gas are also used. The recovered inorganic chemicals are then processed, converted into white liquor, and returned to the digestors. More wood chips are fed into the digestors, and the process is repeated with the recovered chemicals.

In summary, WestRock's mills combust fossil fuels and pull electricity from the grid to provide power for closed systems whereby economically viable operation inherently depends on salvaging both the expensive inorganic chemicals used and the energy content of processed organic substances. Claiming all of the energy recovered from organic materials processed at these facilities as eligible for issuance of renewable energy credits misdefines the actual industrial service being provided, erroneously assumes the retroactive inclusion of preexisting industrial systems in renewable energy credit markets is acceptable, fails to account for the significant quantities of electricity purchased from the local fossil-powered grid, and fails to account for the fossil fuels consumed at the facilities and while harvesting and transporting lumber. This is somewhat analogous to burning coal to generate electricity, using that electricity to pump water uphill to a reservoir, releasing the water from the reservoir to generate hydroelectric power, and falsely claiming the secondary electricity produced is renewable. When each of these mills is viewed in whole, any fraction of the operation that could be contrived as renewable is largely outweighed by the plant's industrial characteristics and dependence on fossil fuel combustion and electricity consumption and is therefore not renewable.

Except for an alleged occasional small fraction of electrical output from the mills, WestRock's facilities provide only on-site energy and do not displace fossil energy resources on the shared grid. Because of this and many other characteristics of the energy produced by WestRock's four facilities, the alleged renewable energy credits procured from these facilities were not renewable, provided no environmental benefit, and lacked other fundamental characteristics required of any environmental commodity. Additionally, the renewable energy credits were self-reported, meaning they were never appropriately vetted by a third-party entity qualified to verify the substantiveness of claimed environmental commodities and to ensure the integrity of such a claim was not compromised by a conflict of interest.

Ward H. Dickson, Executive Vice President and Chief Financial Officer of WestRock, was elected to Ameren's Board of Directors effective June 7, 2018. [74] Shortly thereafter, Ameren developed a deal with WestRock, ultimately closing the mutually beneficial transaction described in this chapter. Somewhere

between 0.8–2.9 million artificial 'renewable energy credits' were claimed, representing 25–90% of Ameren's total Renewable Energy Standard compliance requirement for 2019.[75] Assuming a market value of $20 per renewable energy credit, the benefit to Ameren was an avoided cost of $16–$58 million. Assuming a levelized cost of electricity [x] of $40 per MWh, Ameren avoided a cost of $32–$116 million by delaying investment to construct its own renewable energy facilities. Given the potential use of a biomass renewable energy production tax credit of $12–$25 per MWh, the benefit to WestRock may have been an avoided cost of $10–$65 million.

There are other important specifications of the four WestRock facilities involved in this fraud. The Fernandina, Florence, Hodge, and Panama City pulp and paper mills are located in Florida, South Carolina, Louisiana, and Florida, respectively. None of these mills are near Missouri, which may be another reason Ameren targeted these facilities. No governmental entity or professional accessed WestRock's facility sites and records to verify Ameren's claims. The electric generating units at WestRock's four facilities were installed long ago, with installation years ranging from the 1930s to the 1980s, meaning all of the generators pre-date any state renewable portfolio standard mandate, and the original construction of these facilities was in no way influenced by or made possible by the potential sale of renewable energy credits. Renewable energy credit markets provide an additional revenue stream that incentivizes the installation of new renewable electricity generation facilities. Renewable energy credits are issued when one megawatt-hour of electricity is generated and delivered to the electricity grid from a renewable energy resource. Renewable energy credits are the legal instrument through which renewable energy generation and use claims are substantiated in the U.S. renewable electricity market. Renewable energy credit markets are not and have never been intended for the retroactive inclusion of industrial facilities constructed during the mid-20th century. What effect are renewable portfolio standards to have if electric utilities are allowed to circumvent government mandates by exploiting faraway, preexisting industrial facilities?

The cumulative nameplate capacity of the four industrial combined heat and power systems at the WestRock mills is roughly 318 MW. Combined heat and power systems are used primarily for internal, 'behind-the-meter' use. At most, of the electricity produced by these mills, only the small fraction that is exported onto the grid could conceivably qualify as renewable energy credits, and only after the total electrical production of the mills has been netted of combusted coal, natural gas, oil, and electricity supplied by the grid, all of which

these facilities consume. This was always Walter's understanding and the understanding of the Division of Energy's Deputy Director and Director who managed the certification process. Combined, in 2018 WestRock's four facilities produced 7.8 million tons of CO2-equivalent emissions and generated 1.8 million MWh of electricity.[37] That equates to over 8,600 lbs of CO2 per MWh. For comparison, Ameren's territory, one of the highest emitting regions of the U.S. electric grid, emits roughly 1,500 lbs of CO2 per MWh, meaning WestRock's mills are roughly six times more potent a source of CO2 than Ameren's own coal-fired generation fleet.[76] Furthermore, on a combined annual basis, the four WestRock mills demand more electricity than they provide to the grid. In 2018, the four mills received 254,129 MWh of electricity from their local utility companies and resold 17,154 MWh, or just 7% of the electricity they purchased.[77]

The transaction between Ameren and Westrock involved multiple entities. A foreign intermediary was used, likely to add a layer of anonymity and concealment to reduce the risk of Ameren and WestRock being accused of engaging in illicit activities. Hundreds of thousands of counterfeit renewable energy credits were procured from WestRock's Fernandina Beach, Hodge, Panama City, and Florence Mills, squeezed into the PJM Generation Attribute Tracking System (PJM-GATS) and the North Carolina Renewable Energy Tacking System (NC-RETS), handled by a third-party broker based out of the Netherlands (STX Services B.V.), imported into the North American Renewables Registry (NAR) tracking system, and transferred to and retired in Ameren's Missouri Renewable Energy Standard compliance account.[75][78] Ameren and WestRock never provided proof of the actual transmission of renewable energy to the grid. No metering or billing statements were provided.

In what capacity were Walter's supervisors involved in this, and which individuals within state government are responsible for enabling this issue? "In short, the philosophies of current leadership in Missouri's capital underscore the sickening reality of regulatory capture. A lot of corruption goes on away from the public's attention," Walter expressed. "One implication of extreme circumstances of regulatory capture is the fact that analysts like me who try to stand up for what is not only ethical and logical, but legal, can be dismissed by those willing to turn a blind eye."

Walter researched the operating procedures and manuals of the renewable energy credit tracking systems, combed Missouri statutes and rules to identify those of use as leverage to argue his case, prepared technical reports detailing the nature of the questionable renewable energy credits and the transaction between

Ameren and WestRock, and clearly expressed to his supervisors and others the need to intervene in Ameren's Renewable Energy Standard compliance case before the Missouri Public Service Commission. Walter pushed the issue relentlessly but was quashed in raising his concerns by management within the Division of Energy and leadership within the Department of Natural Resources. Leadership within the Division of Energy followed Carol Comer closely, and this situation was apparently one of many instances of them acting to please Comer, with the desire to protect themselves and potentially advance their own careers by remaining connected to Comer if she advanced to the federal level. Walter's supervisors intentionally excluded him from conference calls with the Public Service Commission and even violated Missouri whistleblower statutes by ordering him not to disseminate the non-confidential information he had gathered, which he reasonably believes evidences a violation of existing regulations and a waste of public resources.

When Walter began disclosing the Ameren-WestRock fraud with entities outside of the Division of Energy and Department of Natural Resources, some organizations and state employees acknowledged the issues he had identified but admitted, given the unique regulatory environment, they were not going to be able to speak up for fear of it impacting their careers or the funds their organizations received. In his final effort to confront Ameren and intervene in the company's Renewable Energy Standard compliance case, Walter engaged the Sierra Club, Great Rivers Environmental Law Center, and the attorney who wrote Missouri's Renewable Energy Standard (the brilliant Henry Robertson).

Using Walter's information and technical reports outlining the fraudulent nature of the Ameren-WestRock transaction, Robertson/ Great Rivers Environmental Law Center and Sierra Club developed and filed comments before the Public Service Commission, presenting the many disturbing issues with the WestRock renewable energy credits. Here are some of Great Rivers Environmental Law Center and Sierra Club's comments that were filed in Missouri PSC Docket No. EO-2020-0328.[79]

- *"Ameren's 2019 RES Compliance Report shows on page 11 that the Company relies on the purchase of more than three million third-party Renewable Energy Certificates (RECs). Credible information has reached Sierra Club showing that some of these RECs come from sources that are ineligible for compliance with Missouri's Renewable Energy Standard."*
- *"At best, only a small part of the electricity produced by these mills—that which is exported onto the grid—could qualify as a renewable energy resource*

under the Missouri RES."

- *"Energy that was consumed in a southern paper mill and never went out onto the grid is of no conceivable service to Missouri."*
- *"CHP is primarily an efficiency measure used by industrial and commercial facilities that burn fossil fuels. It is treated under the Commission's cogeneration rule, 20 CSR 4240–20.060. It is not eligible under the RES even if some amount of electricity goes onto a utility system in another state."*
- *"If it turns out that lignin was separated out of solution and burned, and that this qualifies it as 'plant residue,' it was likely used internally for 'station service,' which does not qualify it for RECs."*
- *"In light of what's been said above, it is doubtful that the RECs from these mill sources have been limited to the renewable portion of the fuel."*
- *"While completing these comments Sierra Club has seen Staff's report and memo filed today in this docket. They say that Staff, and Ameren too, still lack "certain information for RECs purchased through a third party." Staff suggests that Ameren seek a waiver under 20 CSR 4240-20.100(8)(A).1.I. Sierra Club finds this troubling. If Staff does not verify compliance, who does? Staff states that it has verified Ameren has retired enough RECs even though Ameren has not been able to provide sufficient information to confirm this. This docket should not be closed until the missing information is supplied. Sierra Club opposes the grant of a waiver in these circumstances. Sierra Club asks the Commission not to approve Ameren's 2019 Compliance Report, and not to grant a waiver, until it is shown by additional information whether, or to what extent, the WestRock RECs are eligible to be used toward the Missouri RES."*

In the final series of events, Public Service Commission Staff recommended Ameren seek a waiver to be excused from the obligation of providing crucial information required to be disclosed in companies' Renewable Energy Standard compliance reports. On June 23, 2020, in Missouri Public Service Commission Docket No. EE-2020-0411, Ameren filed an application seeking a variance[xi] from Commission Rule 20 CSR 4240-20.100(8)(A)1.I. On July 22, 2020, Public Service Commission Staff filed its recommendation that the Commission grant Ameren's request for a variance. On August 26, 2020, the Commission approved Ameren's request, and on November 9, 2020, File No. EO-2020-0328 was closed.[80][81][82]

Ameren was never required to disclose renewable energy credit meter reads or payments, which do not exist because the alleged 'renewable energy

credits' were counterfeit. A large share of Ameren's renewable energy portfolio for 2019 was no more than an artificial paper trail. Ultimately, the Public Service Commission granted Ameren multiple variances to the Missouri Renewable Energy Standard rules to further facilitate Ameren's compliance for the calendar year 2019. Ameren requested and was granted a variance, removing the company's obligation to provide the following information[83]:

1. The facility name, location (city, state), and owner;
2. That the energy was derived from an eligible renewable energy technology and that the renewable attributes of the energy have not been used to meet the requirements of any other local or state mandate;
3. The renewable energy technology utilized at the facility;
4. The dates and amounts of all payments from the electric utility to the owner of the facility; and
5. All meter readings used for the calculation of the payments.

Had the Public Service Commission determined that Ameren failed to meet its Renewable Energy Standard compliance obligation, Ameren would have been required to make a penalty payment of twice the market value of renewable energy credits for the resulting compliance deficiency, or $32–$116 million assuming a market value of $20 per renewable energy credit. This money would then have been invested in renewable energy on behalf of Missouri's citizens.

After seeing the comments of the Great Rivers Environmental Law Center and the Sierra Club, the Department of Natural Resources opened an HR investigation into Walter's involvement in the matter, "I'm assuming under the guidance of Carol Comer and the Director and Deputy Director of the Division of Energy," said Walter. Walter provided HR personnel with a technical report, a detailed timeline of events, and emails, including the written communication from the Deputy Director of the Division of Energy in violation of Missouri whistleblower statutes ordering him not to disseminate public information—information that was grounded in fact and truly in the best interest of Missouri citizens.

Despite knowing Comer was likely overseeing those HR personnel leading the rigged investigation, Walter opened an HR investigation into leadership within the Division of Energy, took care of a few things before submitting his resignation letter, and moved on to the next stage in his career. "It took the Department of Natural Resource's IT department only a few hours after I notified the Division of Energy of my departure to remotely disable my

equipment and eliminate access to all systems," explained Walter. "I had my equipment promptly delivered to the Department of Natural Resources and walked into my new job the following Monday." That new job and the opportunities that followed were partly the result of Walter disclosing with friends, family, like-minded individuals, and prospective employers the details of his experiences at the State Department. Although the circumstances had led Walter to decide to part ways with the State, his tenacity, morality, and ability to think outside the box were ultimately recognized by other professionals, and he was rewarded with opportunities at new organizations.

It is an honor to share Walter's story with the world. I, personally, was naïve before learning more about energy politics in Missouri, and I underestimated the degree of wickedness of the North American coal-utility complex. Although Walter's efforts resulted in defeat, he does not regret what he went through. "It felt good to do what was right on behalf of those working for the State of Missouri who shared my perspective but were crippled by fear," he said. "It was an honor and a privilege to leverage my capacity earlier in my career to take the risk of acting ethically, knowing the cards were stacked against me."

This degree of purpose, courage, and determination is necessary for climate warriors to help society decarbonize before our clock runs out. We must be brave and confront corporations reluctant to comply with government mandates for reducing emissions. Unfortunately, much more support is needed in Missouri and similar states to help ensure and accelerate emission reductions.

Roughly one year after Walter's departure from the Division of Energy of the Department of Natural Resources, Comer passed away. This was, not surprisingly, followed shortly by the Deputy Director of the Division of Energy announcing her retirement. She had originally announced her retirement before Comer took control of the Division of Energy, but made an abrupt decision to stay when she realized the potential opportunities that could result from cozying up to Comer and enduring the dismantlement of her own organization. This loyalty led to her promotion to Deputy Director under the new Director. Since the Division of Energy's director was replaced in 2019, the Division of Energy has experienced high turnover and meticulous censorship. The Energy Policy and Resources group was muzzled and allowed little flexibility in supporting renewable energy adoption, and was even required to promote coal equally with all other forms of energy. Regarding presentations, publications, litigation, and virtually all deliverables, Comer's stance and the Department of Natural Resources' 'legal' policy was that there must be no mention of the word "climate" in anything, including documents the Division of Energy produced or filed with

the Public Service Commission. On one occasion, the Department of Natural Resources' legal counsel demanded Walter remove a footnote in a document simply because the reference contained the word "climate."

While at the Division of Energy, Walter was invited to present to a 4th-grade science class on the topic of how renewables can help fix climate change. The school had reached out to the Division of Energy with the request. After working with the teacher and creating the presentation, Walter was unable to get approval from The Division of Energy and Department of Natural Resources because the presentation conflicted with leadership's (Comer's) philosophies. Leadership demanded revising the presentation to focus more on coal's importance in Missouri and to remove climate information. Walter refused to make that compromise and chose not to present rather than promote politically motivated ideology. This was censorship of information to the degree of a dictatorship. These restrictions on the Division of Energy are particularly tragic because at one point the Division was well-situated to be a uniquely influential voice promoting climate-positive solutions to the Public Service Commission, utilities, and other energy stakeholders on behalf of all Missourians. Missouri is lacking these voices.

One of the big barriers to tackling global environmental issues, like those rooted in Jefferson City, is the fact that many capital cities are relatively inaccessible. They are isolated echo chambers outside of major cities. Missouri's capital is a small, remote, impoverished, and undesirable river town with little more to offer than a few state office buildings and a prison. Missouri citizens have no desire to visit and no presence in political activities, unlike citizens in and around larger capital cities with healthier economies and more arts, entertainment, and opportunity. This is one reason why Missouri State Government is a relatively dysfunctional and inefficient institution. There is a severe incompetence issue because it is where people go to begin and end their careers. This happens at the expense of taxpayers. Missouri is not alone in this regard. Other states have capitals remote from primary population centers. For the benefit of our democracy, important regulatory affairs are better suited to take place in major cities. Rather than taking place in obscure hearing rooms to which individuals and companies must travel, these issues are deserving of a public presence.

In Jefferson City, there are many career-stranded state employees working at the management level, desperate to retain their positions in state government. This is a suitable environment for regulatory capture. Many of these employees are established in the area, have families, or are seeking to retire and secure a

pension, and there are virtually no opportunities for them outside of state government. For many, it isn't feasible to relocate and find something else. Most who work for the state are severely underpaid relative to industry standards and, for some, the only sensible option is to continue on, do what is necessary to achieve a modest retirement, and remain in the area where the cost of living is low. Sometimes doing what is necessary involves pushing the agenda of the Governor, the Directors, and the Commissioners on behalf of the energy companies. Often, the only ones willing to take risks and stand up to the corruption in Jefferson City are the early-career individuals who view employment with the state as temporary.

There is an endless list of agencies, organizations, non-profits, and other professional groups engaged in driving the changes necessary to effectively combat climate change. There are arranged protests year after year in big cities all over the world. Millions of individuals are donating to support initiatives aiming to change our current trajectory. You can go to Washington, D.C., New York, Los Angeles, or Chicago to march. You can vocalize your concern and project it through social media. These initiatives and organizations may have an impact, but it is more difficult to influence national policy than to influence stakeholders who are more immediately accessible. It may be more lucrative to turn your efforts to state-level politics, which have equally important global climate implications and more accessibility.

Eliminating coal consumption is the most impactful, immediate, and practical large-scale technological step we can take at this moment to drastically cut our emissions in the U.S. We can strategize, collaborate, mobilize, and personally and relentlessly confront some of the political figures in Jefferson City and other capitals where political/energy company strangleholds exist.

If you want to take a pickaxe to the cornerstone of the largest private coal operation in the world, go to the small, sad river town named Jefferson City, not because you want to, but because we need to. Shout at the Governor from the steps of the Ameren building and from down by the Union Pacific Railroad. Go to the Governor's Office Building and shout at the Public Service Commissioners to demand more of the utilities and start prioritizing the people and our climate over shareholder interests. Shout at the Director of the Department of Natural Resources through the window on the top floor of the northeast corner of the Lewis and Clark State Office Building. Most importantly, be a vigilant climate warrior and strategically raise public awareness and gain financial and legal engagement. Missouri's energy companies and the leaders in Jefferson City are deserving of large crowds of citizens, experts, and stakeholders, fighting

relentlessly until things change for the good of our planet.

Lawyers, policymakers, scientists, journalists, and other warriors on the cool side of the climate battle, please listen to this call for reinforcements. The heart of the climate battle beats in many places, but especially in Jefferson City, MO and other small, overlooked cities throughout the U.S. Within these towns exist potential solutions to expedite the collapse of the North American coal supply chain and accelerate the United States towards carbon neutrality. Peabody, Arch, and affiliated entities, we recognize your stranglehold but know that climate change has demanded a strike at your jugular.

[viii] *State capture is systemic political corruption where private and corporate interests significantly influence or dominate a state's policy- and decision-making processes.*

[ix] *A nonattainment area is an area that has worse air quality than is allowed by the National Ambient Air Quality Standards as defined in the Clean Air Act.*

[x] *Levelized cost of electricity can be thought of as the average total cost of building and operating a generating plant per unit of electricity generated over its lifetime.*

[xi] *A waiver or variance is an agency action suspending the requirements of a rule so that they are not applied to an organization on the basis of that organization's particular circumstances.*

Total annual savings from the Actions in Series 2:

330 kg CO2e

2.1% of the average American's footprint

In 1994, an early morning earthquake caused a blackout in Los Angeles, California. Some residents called 911 not because they were harmed by the earthquake but because they were unable to make sense of the ethereal glow in the night sky. They were seeing the Milky Way for the first time.

There are still places where humans experience the astonishing star-saturated universe, but in the U.S., most individuals must travel hundreds of miles to experience something similar to the natural night sky. Light pollution has spread across continents, obstructing our view of the stars. The below photo of the U.S. Gulf Coast at night was taken by one of the NASA Expedition 40 crew members aboard the International Space Station on August 9th, 2014.[84] This photograph shows areas of Texas, Louisiana, Mississippi, and several states that border them further north. The brightest spot is Houston, Texas.

The above image accurately depicts our sprawling electric grid and what it looks like from space at night. The expansiveness of our civilization is truly mind-boggling. Zooming in on our civilization, the below photo was taken on a flight out of Houston, Texas in 2021.

The lights across areas such as Houston obscure nearly every star in the night sky. During partly cloudy nights, reflected light pollution increases night sky brightness to a level disruptive to our circadian rhythms. Is there a better example of unnecessary waste?

Houston has several unofficial nicknames, with the most recently added one being "The Big Heart," referring to Houston's effort to assist the victims of Hurricane Katrina—a storm exacerbated by global warming. Houston's official nickname is "Space City" signifying the city's global role in space exploration as the historical home of NASA. I find it dishearteningly ironic that space is not visible from Space City. No longer are the stars at night big and bright deep in the heart of Texas.

Houston also happens to be the fossil fuel capital of America and has begun to embrace the great energy transition. Houston, we have a problem. We have a warming planet caused by fossil fuel consumption. Hurricane Harvey, scorching heat waves, and other extreme events have given Houstonians a taste of climate change. There may be no city more fitting than Houston to pilot a light pollution reduction program as part of a broader effort to reduce emissions and raise public awareness and urgency around climate change. Space City could show the world that it has a big heart for our climate and could begin by tackling light pollution, a problem that, relative to the timeline for achieving carbon neutrality, could be solved overnight.

Much of the light we produce is unnecessary. Examples of unnecessary uses of outdoor nighttime light include streetlights on open highways, lights in rural backyards or on arbitrary telephone poles with no apparent purpose other

than to help the corn grow, commercial districts with other adequate security measures, and the list goes on. Outdoor security lighting systems, such as all-night floodlights, are commonly used because many believe constant illumination is an excellent crime deterrent. Literature suggests there is little if any link between constant lighting and crime, but that crime may be reduced when smaller amounts of motion-sensing outdoor lighting are used.[85][86][87][88] Sure, there are benefits from nighttime lighting when used properly, such as increased pedestrian and vehicular travel safety in crucial areas, but most streetlights are unnecessary and illuminate a conflict of interest. This conflict of interest, I believe, partly explains why we have relinquished our night sky to artificial light sources despite the profound impact of light pollution on nocturnal ecosystems.

When someone stands to profit from the consumption of a good or service, more of that good or service is often consumed than is necessary. This is certainly the case for gasoline, with key industry stakeholders being long-time promoters and enablers of our oversized vehicle-centric culture. This issue of inefficient overconsumption also applies to electricity consumption. Across the United States, historically and to this day, many electric utilities' revenues depend on how much energy they can sell to consumers. This is known as the throughput incentive. Revenue increases if these companies can find new ways to guarantee electricity consumption. What better way is there to guarantee increases in revenue than to continuously install lights that stay on all night? Conversely, if efficiency or conservation measures are put in place, revenues decrease in conjunction with decreased electricity consumption.

In the past, many utilities have wastefully expanded their outdoor and municipal lighting programs to capitalize on the throughput incentive. This is somewhat analogous to oil companies' efforts to fight fuel efficiency standards in order to maintain low fuel economies across vehicle fleets in the American auto manufacturing space. Whether the commodity is fuel or electrons, the throughput incentive is an issue. There are ways regulators can address the throughput incentive, one of which is implementing a regulatory mechanism known as revenue decoupling. Revenue decoupling allows utilities to receive fair compensation by determining required revenues through a regulatory formula rather than allowing revenue to increase or decrease limitlessly with varying demand. This mechanism removes the pressure on utilities to sell as much energy as possible by dissolving the relationship between revenues and sales volume. This can be beneficial because it removes the threat of utility-sponsored energy efficiency programs eroding their future revenue.

Another factor supporting the past expansion of outdoor lighting relates

to how costs are allocated. Individuals are less likely to continue using outdoor lighting if they are directly impacted by the cost of lighting service from their utility company. Utility companies are conscious of this and have designed programs and rate structures through which outdoor lighting costs are often not directly assigned to the people using the lighting but are instead indirectly spread across entire municipalities or classes of customers. Across our nation, streetlights have been installed in areas with no need for nighttime lighting.

This wastefulness is costing not just communities and society but also ecosystems, as will be discussed shortly. Lighting provides us an area for improvement, a unique opportunity to reduce our emissions and improve our environment. Unlike many other energy uses it is extremely easy to increase lighting efficiency and conservation. Just screw it in and turn it off.

Action 5 – Make sure all the lights in your home are LEDs.

The light-emitting diode (LED) is one of the single greatest breakthroughs in energy-efficient technology, saving the world billions of dollars and tons of greenhouse gas emissions, with the potential to save so much more. Unfortunately, LED lighting has yet to reach many residences, comprising a little over half of all the bulbs installed in households across America. This is a remarkable improvement from just a few years prior, but there's still a lot of opportunity for savings. If you have outdated lights installed in your home, you are like many Americans. Even though those outdated light bulbs may be in working condition, and similar outdated light bulbs in the store may or may not be slightly cheaper than LEDs, it is most definitely cheaper for you to immediately replace your older bulbs with new LEDs. Whether you are a homeowner or renting a unit, you will feel the savings in the first year. With LED varieties that include soft, dimmable, and warm, you don't have to make any aesthetic sacrifices when switching to LEDs.

By not completing this action, you consciously decide to pay more for lighting. But it's not just the money that matters. LEDs use a fraction of the energy of incandescents and CFLs because LEDs convert virtually all of the electricity into light. You can place your hand directly on an LED light that's been on for a while without burning yourself. Non-LED bulbs, on the other hand, produce a significant amount of waste heat. Take a walk around your home and remove all the hotter bulbs. Double-check labels to ensure you aren't removing any LEDs. Based on estimates of the number of incandescents, CFLs, and LEDs in the average American home, by completing Action 5 you will prevent 70 kg of CO2, or 0.4% of your greenhouse gas emissions, from entering

our atmosphere each year. These first-year savings will more than offset the cost of buying LEDs to complete this action.

Action 6 – Only leave a light on if you are truly using it.

Turning off the lights when they aren't in use is one of the simplest ways to save energy at home. Since you've installed LEDs to complete Action 5, your savings from turning off the lights will be less, but you should always turn off the lights when you leave the room. Before leaving your home, check to make sure you aren't leaving lights on and wasting energy and money during the day. When you are home, you and those you live with only need a few lights on at any given time, if at all during the day. In the evenings, it is best not to be exposed to bright light because it can interfere with your body's sleep pattern. Feel free to dim the lights! By cutting down on your lighting use, you can save yourself another 20 kg of CO2 per year, or 0.1% of your annual emissions, even after switching to highly efficient LEDs.

If you find it difficult to achieve savings by diligently turning off the lights inside, consider reducing or eliminating outdoor lighting at night (if this is an option for you). This will draw fewer insects into your home during the summer and reduce light pollution, making your local stargazers happy! Private outdoor lighting and streetlighting have proliferated over the past couple of decades, and we have seen an exponential increase in night sky brightness across the globe. Today, the typical American would need to drive several hours to find a big enough gap in light pollution for quality stargazing. Fly over our extensive nation at night, and you'll experience the incessant glow the entire way. This continent-wide night light has significant environmental effects beyond the emissions from powering the lights.

I'm sure you've noticed the swarms of insects smashing themselves into bright lights at night. This is no laughing matter. Most nocturnal insects are phototactic; that is, they are either attracted to or repelled by light sources. They rely on natural light to orient and guide themselves. Many of us assume all creatures in nature experience the world around us exactly as we do, but this couldn't be more foolish. Ignoring the nonvisual senses, other species can detect, respond to, and be harmed by wavelengths and intensities of light invisible to us. Some species even have access to an entire visual dimension beyond that of humans' trichromatic vision and can perceive colors and details not just invisible to us but literally beyond our comprehension. The sound and light produced by cities are so overwhelming and harmful for countless species that their existence is impossible anywhere near it. For example, insects rely on *natural* light sources

as navigation tools, mating beacons, and more. When we introduce artificial light into a healthy nocturnal ecosystem, we see biodiversity and ecosystem health decrease over time. Moths are particularly attracted to artificial night light. They are also responsible for pollinating plants, working the night shift while bees, butterflies, and other daytime pollinators are inactive. Globally, there are roughly ten times as many species of moths as there are butterflies. Moths' important roles in agriculture and plant-pollinator ecosystem functions are underappreciated. If not for your wallet or your friendly neighborhood stargazer, say goodbye to your outdoor light for the sake of our valuable and vulnerable night-time pollinators. They are working for us without pay, and the bees need all the help they can get. If you are so fond of your outdoor lighting that you just can't give it up, you can select specific outdoor lights that minimize harm to insects, such as a dimmer LED light that is filtered to be amber in color rather than white.

Now that we've covered lighting, it's time to move on to appliances and devices. My disclosure of some of the details of the U.S. coal industry and the story of the Grasberg mine in Papua are just a couple examples of the many impacts of our electric grid and the things connected to it. Your appliances and devices in your home may contain elements from the Grasberg mine or from other mines with a problematic past, and they may be powered by coal from the PRB in Wyoming or other coal mining strongholds. The window of opportunity to avoid the impacts associated with the initial purchase of the various gadgets used throughout your home has already passed. You can still curb their remaining impact on our planet by minimizing their usage and reselling or disposing of them responsibly when the time comes. You can also avoid future purchases of unnecessary gadgets and devices. Reducing usage (and therefore energy consumption) of appliances and devices in your home reduces emissions and demands placed on raw materials, thus mitigating both climate change and the impacts of mining and resource extraction to support our electrified world. Here are a few more easy ways to shave some emissions.

Action 7 – Hang your clothes up to dry instead of using the dryer.

There are many reasons why line drying or drying your clothes on a drying rack is superior to using a mechanical dryer. When you pull lint out of the lint trap in your dryer, you are cleaning out the damage done to your clothes. The heat and abrasion of mechanical dryers shorten the life of your clothes, therefore

causing you to purchase more clothes throughout your life. Letting your clothes hang to dry will avoid this unnecessary damage and prevent your clothes from withering and shrinking. Letting your clothes hang dry doesn't result in horrible wrinkles. Just be sure to give your clothes a good shake before you hang them up so they dry smoothly. The weight of your wet clothes will leave them mostly wrinkle-free by the time they are dry. If you're lucky enough to have space to line dry your clothes outside, take advantage of all the sunny days you can. The sun's UV rays are often intense enough to sanitize your clothes, even in higher latitudes. If you hang your clothes up to dry inside during the winter, you'll increase your home's humidity, which is often desirable. Natural drying systems come in varieties including wall-mounted, foldable, portable, ceiling-mounted, and customizable just to name a few. Go check it out! By letting your clothes hang dry, you'll save a substantial 90 kg of CO2, or 0.6% of your emissions, annually, not to mention avoiding the cost of operating a dryer.

Action 8 – Use the energy saver dishwasher cycle without heated dry.

Some Americans have dishwashers but elect not to use them. But most of those that do use them use the default cycle with heated dry. It may come as a surprise, but using your dishwasher actually saves water and energy over hand washing your dishes because of the minimal hot water usage of modern dishwashers. This, however, may not be the case if you have adopted the previously discussed habits of mindful and minimal hot water usage. When using the dishwasher, use the energy saver cycle to ensure your dishwasher uses as little energy as possible. To make doing dishes even more energy efficient, it is important to avoid using your dishwasher's heated dry cycle. There is no need to use the heated dry cycle unless you are in some race against the clock to dry your dishes. It adds time to the wash cycle and increases wear on your machine, shortening its life. Instead, simply change the setting on your dishwasher and open the dishwasher door at the end of each cycle to allow your dishes to air dry. To avoid unnecessary hot water usage and further boost your efficiency in the kitchen, stop pre-rinsing your dishes before placing them in the wash. Just scrape off the food debris and you are done. Your dishwasher can likely handle the rest. By setting your dishwasher to the most energy-efficient mode, skipping the heated dry cycle, and only running full loads, you will save a couple of bucks and several pounds of CO2 per year. The annual impact of committing to Action 8 is roughly 10 kg of CO2 (0.1% of your annual emissions).

Action 9 – Unplug everything. Only plug things in while you use them.

This action often helps individuals realize just how much stuff they have. Look around your home. Surely, there are lots of things that remain plugged into your walls 24/7/365. All the gadgets that remain plugged in year-round can account for 10% of your home's total electricity consumption, or possibly more.[89][90][91] Many electronic devices and appliances consume power even while they are switched off. This use of power when not in use is commonly referred to as standby power, phantom load, ghost load, or vampire load. Some common devices with a bad reputation for leeching power are devices with plug-in adapters, remote-controlled devices, and devices with standby lights or clocks. Some more specific examples include cable/satellite boxes, video game consoles, DVD players, wireless routers, smart speakers, and more.

So, how can you eradicate these energy leeches? Over the course of a year, you can save up to a month's worth of electricity by unplugging your appliances, devices, and gadgets from the wall when not in use. If you'd like to make things easier, you can invest in smart power strips to assist in reducing your standby load. Power strips will make this action seem less daunting by enabling you to flip a switch or unplug one chord, rather than having to individually unplug multiple gadgets. There are even smart plugs that connect to Wi-Fi and can be turned on and off from your phone! You may be surprised how much you can save just by unplugging unused devices and appliances in your home. Doing this is well worth the effort. Rather than thinking of Action 9 as an inconvenience, consider it a constant reminder of how expensive convenience can be and how convenience-driven lifestyles often contribute significantly to greenhouse gas emissions. The annual impact of making an honest effort to reduce your home's standby load is 90 kg of CO2 (0.6% of your annual emissions).

Action 10 – Maintain your fridge and check its temperature.

Refrigeration represents approximately 7%, or more, of your at-home electricity consumption each year.[92] You can do several things to ensure your food box is operating as efficiently as possible. The main thing you need to do is check to make sure the temperatures of your fridge and freezer aren't too low. Right at or just below 40°F (4.4°C) for the fridge and no less than 0°F (-18°C) for the freezer is plenty cold.[93] Keeping your fridge or freezer any colder than this is an unnecessary waste of energy. You may need to use a thermometer and allow 24 hours for the temperature to adjust after changing it. Check every few months to ensure the temperatures remain at the desired setting. If your fridge is colder than it needs to be, you'll waste *some* energy. Conversely, if your fridge is not cold enough, food will spoil sooner, and the emissions associated with increased food

waste will offset the energy you saved by being too aggressive with the temperature setting.

It is also important to ensure nothing is obstructing airflow behind your refrigerator so that the condenser coils can work efficiently. There should be a minimum of two inches of space between the back of your refrigerator and the wall. While you're at it, clean the condenser coils on the back of your refrigerator, removing dust and debris so heat can be released from your fridge. The condenser coils could use attention a couple of times a year. Setting a calendar maintenance reminder for your fridge is a good idea.

Keeping your fridge and freezer full will also help increase the efficiency of your unit. If your refrigerator or freezer is regularly empty, but you still use it, putting a couple of bags of ice in the freezer and some large, sealed containers (e.g. milk jugs) filled with cold water in the fridge will reduce the volume of air your fridge must work to cool. The containers of water, or anything in your refrigerator with moisture, should be sealed because moisture forces your refrigerator's compressor to work harder. Make sure to leave some free space though, as the inside of a fridge requires some air circulation to operate effectively. There are a couple of other essential maintenance items, such as regularly defrosting your freezer and ensuring your refrigerator door seals are airtight.

Your refrigerator is one of your most energy-hungry appliances. These are all things you can do to control this beast's appetite. The personal annual impact of committing to Action 10 is 20 kg of CO2 (0.1% of your annual emissions). This calculation, like the others, excludes the additional emissions benefit attributed to your housemates' refrigerator usage.

Action 11 – Only run full loads of laundry and always use cold water.

Water heating consumes most of the energy required to wash a load of laundry. Around half of Americans already wash their clothes using the cold-water temperature setting on their machine. This is because washing your clothes in cold water saves energy and helps preserve the color and shape of your clothes. Additionally, many laundry detergent brands have been developed specifically for use in cold water and are less effective at higher temperatures. Incorporating this action into your life is as simple as consciously pushing the right button on laundry day. While you're at it, go ahead and top off that washer to fully incorporate Action 11 into your life. Make sure everything you're washing is actually dirty. For example, many types of clothing, like jeans, can be worn several times before washing. By using cold water and consolidating your loads, you can

avoid 30 kg of CO2 emissions per year (0.2% of your annual emissions).

There are varying degrees of climate denial. The term "climate denier" refers to those who refuse to accept or integrate into their lives the reality that climate change is happening, is caused by humans, and/or is a threat to civilization. By this definition, most climate deniers are those who implicitly deny climate change. More likely than not, this includes you and me in some ways. Individuals who accept climate science but fail to reflect their knowledge in their lifestyles and actions can be classified as implicit deniers. By this logic and generally speaking regarding the ecologically disconnected American lifestyle, most of us in the U.S. are also implicit deniers of our broader environmental impacts.

Implicit climate denial and more extreme forms of climate denial are so prevalent because our modern lives are so far removed from nature and because people naturally tend to avoid thinking critically about unpleasant things. Deeply contemplating the rate of species loss and the decline of the Earth system due to human activity is discomforting. Our mental frames and cognitive shields allow us to rationalize our environmentally destructive ways of living, partake in excessive consumption, and continue dumping carbon into the atmosphere with little or perhaps no anxiety or guilt. We may actively observe and discuss the need for climate action but through implicit denial somehow preserve largely unaltered lifestyles. This cognitive dissonance can be erased by taking action and making positive climate changes.

For the remainder of this chapter, however, I will use the term "climate denier" to refer only to those less accepting of climate science who are dismissive of it or in complete denial, excluding implicit denial.

The state of climate denial in the U.S. is embarrassing and it indeed deserves our time and energy. The U.S. is unique in that the share of our population that denies or dismisses climate change is larger than in most other nations.[94][95] Approximately 12% of U.S. citizens doubt global warming is happening, and 8% of Americans dismiss climate change altogether.[96] This subset of the U.S. population is politically engaged and just large enough to be a significant impediment to social progress across multiple domains. Difficult conversations about climate change need to be had. A more strategic and

disciplined approach in our exchanges with deniers can help shift public perception and break the echo chamber of climate denial.

Many believe communicating with climate deniers is a fruitless endeavor. Occasionally this is certainly true, as they are a special bunch that can be difficult to interact with. Not all climate deniers are approachable, and it is important to be able to identify this. There are a small number of individuals who are too far gone to be influenced at all. Some climate deniers flare their tempers even when gently nudged on the topic. For these individuals, the passing of time itself may be the only thing that can convey the truth. Even the most tactful, surgical, and consistent efforts have no chance of altering their perceptions of reality. These are the lost souls, but many others are worth the trouble of influencing.

Attempting to alter others' perceptions of climate change, especially when doing so across great political divides, requires not only tactfulness but also incredible patience. It can be easy to become frustrated while confronting climate denial and abandon the whole situation. More of us must be willing to grin and bear it, be the bigger person, and maintain an even temper throughout many difficult conversations. Most climate deniers are, at their core, uncertain of their climate convictions and can be influenced, however subtly. I hope to better prepare you for those important opportunities to affect the outlook of *persuasible* deniers.

Before diving into the details, there are a few prerequisites for understanding how to approach climate denial. First and foremost, climate denial is an ideological and psychological issue, not an informational issue. You should maintain an immense amount of respect for the fact that, for some, the topic of climate change is not perceived as a mere technical discussion but rather a direct ideological and psychological threat. Climate deniers use motivated reasoning to arrive at conclusions consistent with their pre-existing values and sense of self. This is why it is typically ineffective to attempt to influence deniers through data and science alone. Although sharing factual information has its uses, you're likely going to have to find other ways to connect with deniers, such as focusing on their pre-existing values. Science, data, and information are useless if an individual isn't in a receptive state of mind to begin with.

It is important to mitigate divisiveness and find common ground to open people's minds to the idea of helping combat climate change or, at the very least, not obstructing progress. Creating conflict is counterproductive, and there are ways to approach and influence climate deniers in a manner that avoids polarization. We should attempt to get deniers to open up and put down their defenses so they can deal with difficult material. Ultimately, we want to show

them we are on their side and communicate how climate change is affecting their way of life, how it threatens things they value and enjoy, what their future would look like under a business-as-usual scenario, and, importantly, how renewable energy and other low- to no-emission changes *do* benefit them.

Deniers are more accepting of facts when there is a way for that information to be perceived as beneficial to their status and worldview. We can address their viewpoints in a manner that is less likely to be perceived as threatening to conservative and nationalistic ideologies. This complex endeavor requires a basic understanding of the psychology of climate denial and an awareness of common climate denial techniques.

There is a wealth of resources available concerning common climate change myths, how climate misinformation and disinformation propagate throughout society, and typical counterarguments used by climate deniers. We can learn from this information to better prepare ourselves for dealing with climate denial. We can also learn a lot from exposing ourselves to climate denial and confronting it. However, direct experience is just part of the groundwork for improving one's ability to combat climate contrarianism. It is advantageous to take a step back and analyze climate denial to break the issue down to its more fundamental levels. By identifying and becoming familiar with specific behavioral and psychological patterns among deniers, we can develop effective tools for handling unpredictable conversations with them. The better we understand deniers, the more likely we are to influence them.

I must re-emphasize climate denial itself is not simply a matter of information-driven discussions regarding climate science but is primarily an ideological battle centered around social and cultural values and one's sense of self. In most instances, the core of an individual's denialist convictions does not rest on bits of information related to climate change but rather what the individual believes about who they are and where they stand relative to those around them. For this reason, when engaging with deniers you should not fixate on the specific claims they are making, but the deeper origin of these statements —the psychological and ideological birthplace of their opinions and disposition. By taking yourself into this deeper dimension of communication, you position yourself within the ideological foundation and mental frame that houses their opinions. This is extremely useful for influencing deniers more holistically rather than merely swaying them on a few one-off topics of discussion. When we alter a way of thinking rather than an opinion, we make honest progress toward dissolving climate denial and preventing further propagation of disinformation throughout society.

I have reflected on my conversations with climate deniers over the past decade to try to improve my approach. These conversations have occurred in settings ranging from subdued office environments to rowdy bar scenes. You can imagine the approach in each scenario should be slightly different, and some conversations are more tense than others. I'll be the first to admit there have been times when I've been reckless when I should have been a more tactful climate envoy. I still find myself in situations where I've accidentally caused someone to steam up, but this isn't necessarily a sign of failure. People tend to get angry when their ego is threatened or they feel trapped. I think it's unreasonable to expect to be able to tweak someone's ideological dials without *some* turbulence.

In addition to collecting and reflecting on personal experiences and relationships with climate deniers, I have compiled hundreds of common statements, counterarguments, and assertions made by deniers. I then classified these interactions based on my understanding of their behavioral and psychological characteristics. The sum of these efforts has revealed several underlying dimensions of climate denial, presented below in what I refer to as the "United States Collective Climate Denial Mental Model." This mental model does not apply in its entirety to most individual climate deniers. The model does, however, apply to the broader population of climate deniers in the United States when considering their collective values and beliefs. In other words, each of the components in the diagram below reflect trends in beliefs, values, behavior, identity, and perception among the total population of climate deniers.

As you can see suggested in the diagram above, climate denial is about perceived threats to one's sense of self. An individual's identity, values, beliefs, and ways of thinking cause them to respond in certain ways during conversations

about social and political issues and to employ self-protective strategies. These self-protective strategies serve the psychological needs of the denier and help them preserve foundational systems of thought and their broader worldview. The two most interesting elements of collective climate denial are the right-wing authoritarian (RWA) and social dominance orientation (SDO) personality traits. These two personality traits have an additive effect, which may be amplified by religious fundamentalism, and enable individuals to rationalize indifference toward major social and environmental issues such as climate change.

The three main "pillars" or categories containing the underlying dimensions of collective climate denial are the superiority complex, social identities and behavior, and other pre-existing values and beliefs. I'll begin with the superiority complex, which in my experience has been the most prominent and challenging of the three to deal with.

It makes sense that many climate deniers have a superiority complex. For one, it is easier to dismiss and discredit the entire scientific community and vast majority of the general population if you somehow believe you are superior to them and able to see something they just can't. Although they are clearly delusional, many climate deniers who dismiss climate change altogether truly believe the world around them has gone mad, that the public has bought into a conspiracy or is irrational or alarmist. On the less extreme end of the climate denial spectrum are those who guardedly concede that climate change is happening, that global warming is happening but doubt its significance, the role of humans, or the need to make dramatic changes to our current way of life. Many of these individuals' superiority complexes manifest as an innate reluctance to admit a lack of knowledge on virtually any matter, whether related to science, policy, the economy, or other topics. These individuals have a distinct tendency to compensate for a lack of knowledge or understanding in a particular area by rejecting or discrediting information or ideas and by projecting confidence and authority in a muddled and often irritated manner to preserve their favorable view of themselves.

You can observe this by paying close attention while a denier expresses or reinforces their opinion on a climate-related topic. It is crucial to focus exclusively on the individual's verbal communication, remaining unaffected by the non-verbal aspects of their message. Do not underestimate the power of nonverbal communication; just be aware that you are less likely to be influenced by it if you can unemotionally focus exclusively on the denier's logic rather than their diction, tone, hand movements, facial expressions, etc. Getting emotionally charged will not benefit you.

When crafting responses to deniers, one can objectively highlight any vagueness in the information the individual has provided by requesting more specific information about their stated opinion. Don't let the individual counter with their own question, as they are likely hoping your inability to respond to an arbitrary, irrelevant question will humiliate your viewpoint and diminish your credibility. Do not let the individual divert the conversation and act as if their irrelevant statement is extremely crucial or central to understanding the climate issue. Remain focused on their original opinions and be persistent about getting them to expand on such statements. Your objective is to mine their knowledge and identify the limit of information they can provide. Calculate a response likely to develop the conversation around the individual's original statements. Try to reveal gaps in knowledge by continuously shifting the dialogue to places that pressure the individual to elaborate. Pin them in their own corner by getting them to think critically about their original stated opinion. Guide the denier and moderate their thoughts so they have to confront some of the deficiencies in their understanding of climate change.

All of this probing will make the individual uncomfortable. They may continue throwing up diversions to create chaos, hoping to derail the conversation to their advantage. This helps them avoid challenges to their worldview and ego, which is often the birthplace of indefensible, yet strong, opinions. These diversions can include things such as aiming to portray uncertainty by proclaiming an inadequacy or error in the available data and information or asserting there is some major factor that the scientific community has failed to consider. Another common diversion is the assertion that climate and environmental regulations threaten to erode our individual freedoms or quality of life. If the denier doesn't succeed in attempting to retreat from a topic by throwing up diversions, they may become frustrated and overcommit to a particular idea or strategy. Their reluctance to admit they just don't know or aren't right can force them to resort to more desperate tactics, such as attempting to intimidate and manipulate others.

To put it plainly, if you talk to enough climate deniers, you'll realize that many of them think very highly of themselves. Their arrogance can make conversing with them an utterly painful and frustrating task. As part of their superiority complex, they often exhibit mental rigidity, that is, they are unable to appreciate others' viewpoints and believe they have the only correct perspective. Additionally, egoism, a philosophical theory where self-interest is the foundation of morality and determines or influences one's actions and beliefs, and egotism, the inflated sense of self-image and self-importance that moderates decisions by

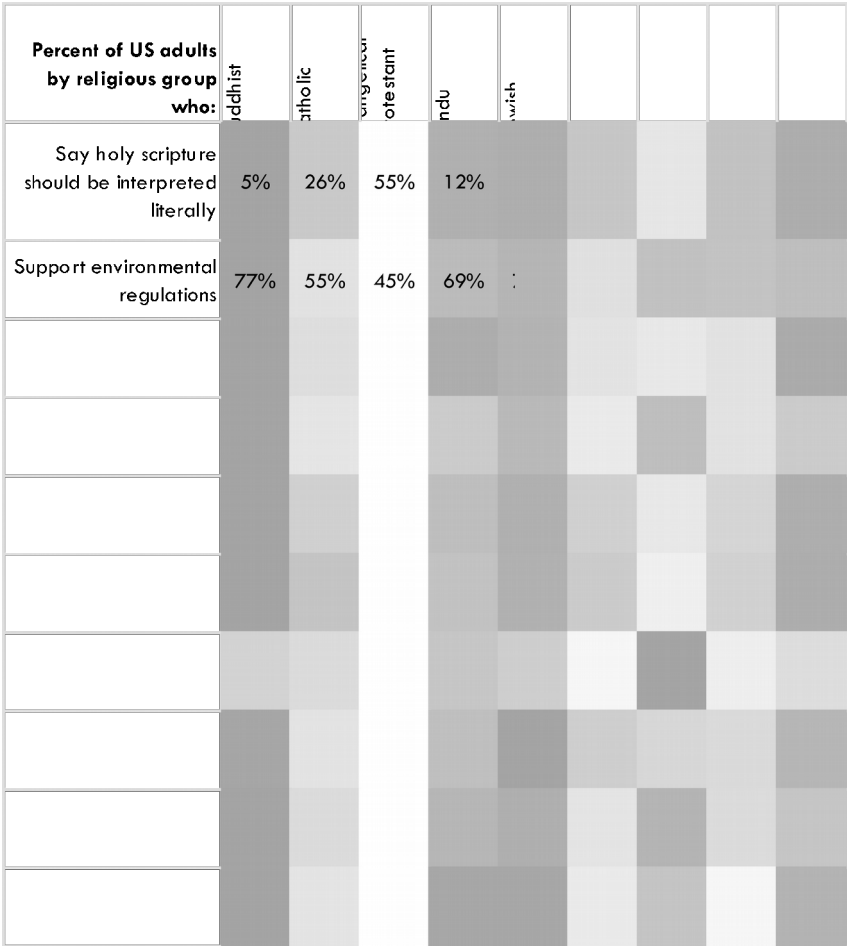
taking into account inputs from the social and physical environment, as well as primitive impulses, are more prominent among climate deniers.[97][98][99] All of these personality traits are likely amplified by innate insecurities and can have a dramatic impact on familial and interpersonal relationships and dynamics, but perhaps none as much as social dominance orientation (SDO).

Social dominance orientation (SDO) is a measure of the degree to which individuals support hierarchies within society and the domination of 'inferior' subpopulations and is a strong predictor of climate denial." [100][101][102]One way to exploit SDO is to leverage hierarchical systems of thinking. You do not need to be alone in your endeavor of influencing climate deniers. For example, Nephew or Niece X is less likely to influence Uncle Denier than is Aunt or Uncle Climate, Grandpa Climate, or Other Respected Individual Y. Having a more respected (that is, respected in the eyes of Uncle Denier) individual present and involved when attempting to influence Uncle Denier shifts the dynamic of the entire conversation. It is these hierarchical systems of thinking that make corporate cultures the perfect environment for altering the perspectives of deniers.

Individuals with high SDO scores are more likely to believe in and support social *and* natural hierarchies. Not only do they view themselves as above other humans and have a preference for nonegalitarian hierarchical relationships between social groups, but they may also be more likely to view humans as far superior to and ineffably unique from all other species.[103][104] In other words, high-SDO individuals don't just want to think they are above those around them; they want to feel like they are on top of the entire natural world. This is where the superiority complex begins to intertwine with social identities and behavior in the collective climate denial mental model.

Social dominance orientation and religious fundamentalism complement each other to the degree that individuals perceive themselves as separate from and superior to the world around them. Religious fundamentalism (in the contemporary sense) is characterized by literalism, or the degree to which holy scripture is interpreted literally. Religious fundamentalists who believe scripture should be interpreted more literally often disregard alternative and more modernistic interpretations of metaphors, symbolism, and ambiguities within religious texts. This rigid approach to spirituality is dangerous because it can lead individuals to a skewed perception of reality, lead them to believe in their faith as the far superior, one true faith, and cause them to view themselves as greatly separated from the rest of the world, especially as the world continues to change at a breakneck pace. Fundamentalists are less willing to bend and evolve their

social and political views to the extent those changes clash with their faith. Religious fundamentalists are often self-righteous, intolerant of others' beliefs and perspectives, and have objections to aspects of reality that may contradict their literal interpretation of the scripture, such as biological evolution through natural selection and anthropogenic climate change. In modern times, religious fundamentalism is most prevalent within Evangelical Protestantism, and Evangelical Protestants tend to hold objections to evolution, climate change, same-sex marriage, environmental regulation, and other issues more so than other religiously affiliated and unaffiliated groups. This is apparent in the figures below, which are based on results from surveys conducted by Pew Research Center.[105] [106]



Percent of US adults by religious group who think:	atholic	ote stant	ote stant		
Human activity is the main cause of global warming.	54%	32%	50%		
Climate change is a very serious problem.	57%	34%	55%		
God is in control of the climate	18%	34%	20%		

As you can see in the above figures, Evangelical Protestantism, which expresses the greatest degree of fundamentalism, is an outlier regarding climate change and across many other major social and political issues. As the largest religious group in the United States, representing roughly a quarter of the U.S. population, Evangelical Protestants greatly influence American politics. Unfortunately, some of their religious values and beliefs collectively translate into comparatively counterproductive social and political stances. As someone who was raised Catholic, attended Catholic school for nine years, and has logged a thousand hours on creaky pews and kneelers, I understand faith can be a powerful tool for improving or hindering society. We are marching toward an uncertain future on a less hospitable, overcrowded planet, bringing with us certain versions of faith that are manifestly incompatible with social progress and the healing and restoration of the Earth. It is worth considering the collective work different religions do on society, including their collective effects on how people interact with and perceive the natural world. Christianity decrees a division between nature and divinity, a division that may call one to question the collective work this is doing for us today. Ideally, spirituality can help heal the division between nature and divinity, enhancing our respect for and service to the natural world, without which we are nothing.

Christianity and other monotheistic religions reinforce the imago Dei intrinsic value system, which, if taken literally, plants the seed for a hierarchical worldview. From the Latin version of the Bible, the phrase *"imago Dei"* translates to "image of God," and the imago Dei intrinsic value system is the Christian belief that there is a special connection between God and humanity, but not

between God and other species. Many fundamentalist Christians believe that humans were created in the likeness of God and are the only creatures endowed with a significant capacity for reasoning, self-consciousness, morality, and spiritual growth. Such a human-centric belief system conditions individuals to look down on and exploit or "subdue" the natural world.[xii] Similarly, the depiction of God as a white male conditions individuals to view white men as more leadership worthy.[107] Fundamentalist Christians are more likely to deny climate change, have objections to evolution, and subscribe to speciesism and other -isms.[108][109] Climate deniers, who collectively score high in SDO and skew towards religious fundamentalism, are significantly more likely than the general population to be sexist or racist, to be indifferent toward social and economic inequities imposed on others, and to be indifferent toward the suffering of other species that are resulting from the general degradation of the natural world, thus making the entire intersectional crisis of climate change more palatable.[110][111]

Another prevailing social and behavioral characteristic of the collective climate denier is the right-wing authoritarian (RWA) personality type, which expands on and compounds some issues arising from religious fundamentalism and social dominance orientation. In the field of psychology, the right-wing authoritarian personality type is defined by conformist thought and behavior, dogmatism, a conventional and exclusionary mindset, and a proclivity for aggression in the name of perceived authority figures. Right-wing authoritarian personality types are intolerant of differences among groups of people, adhere to conventional values, have strong anti-egalitarian preferences, and are more willing to attack or oppress those who they consider as part of an "out-group." Despite their similarities, right-wing authoritarianism and social dominance orientation are distinct personality types; however, the combination of these two personality types may have an additive effect.[112] Right-wing authoritarian personality types tend to be conservatives over 40 years of age and rely on relatively compartmentalized, "black-and-white" systems of thinking.[113][114] This approach to thinking about and dealing with complex issues means the denier is prone to holding many contradictory views, engaging in confirmation bias and motivated denial, and accepting misinformation, disinformation, and propaganda. Religious fundamentalism, social dominance orientation, and right-wing authoritarianism are all predictors of prejudice and climate denial; however, there is reason to suspect right-wing authoritarianism may be playing a more fundamental role in the psyche of the climate denier.[115] Aside from right-wing authoritarianism having a comparatively strong connection to religious

fundamentalism, having an additive relationship with social dominance orientation, and acting as a catalyst for disinformation and propaganda, it is also associated with negative environmental attitudes, the rejection of science, aggression, and a general desire for the destabilization of democratic systems of governance.[116][117][118][119] Right-wing authoritarianism is directly or indirectly connected to most of the underlying dimensions of climate denial, and it is not by happenstance that it was placed at the center of the collective climate denial mental model.

It is clear the many dimensions of climate denial are deeply interconnected and relate to a wider array of social and behavioral issues. It should not surprise us that climate denial is multifaceted, as climate change affects nearly every aspect of our lives. So many Americans have adopted lifestyles of excessive consumption and waste that are dramatically incompatible with the necessary changes we are faced with. The United States has developed an exceptionally materialist, fossil fuel-intense culture, which is taken to extremes within conservative male subcultures. For many climate deniers who conform to these extremes, climate policy is viewed as attacking their culture and way of life. Collectively, climate deniers tend to embrace pro-fossil fuel personas, sometimes to the degree that they associate fossil fuel consumption with masculinity. This is one reason our roads have so many needlessly oversized vehicles. Petro-masculinity is the association of masculinity with trucks, machines, and fossil fuel consumption and may also be associated with a general desire for authoritarianism.[120] The widespread phenomenon of petro-masculinity in the United States is the excessive, wasteful, and counterproductive value signaling of a culturally insipid population, a sociopolitical byproduct of an insecure white capitalist patriarchy.

Eliminating our greenhouse gas emissions is an overwhelming challenge, ignoring additional social and political barriers. Unfortunately, those barriers abound. Aside from the general lack of public urgency, climate change has a right-wing authoritarian problem; it has a social dominance orientation problem, a religious fundamentalism problem, and a materialist, fossil fuel-intense, conservative culture problem. All of these issues are interrelated in many ways, one of which is they have a stranglehold on the Republican Party at least partly as a result of pluralistic ignorance. Pluralistic ignorance is a phenomenon whereby the majority of a group privately disagrees or is not in alignment with the prevailing position of their group, resulting in a magnified minority holding a false majority position. In other words, the stances of a political party are not necessarily representative of the perspectives of the majority or largest wedge of

the political party's members. The Republican Party is not truly as extreme as it appears on its surface, and climate deniers who do not even believe global warming is happening are indeed a minority within the Party. Yet somehow, in the 21st century, this extreme form of climate denial took over. The issue of climate denial blocking climate policy is indeed one of a magnified, amplified, conservative, male, fossil fuel-backed minority. By targeting this subpopulation to alter their views, broader changes can occur within the Republican Party.

So how can all of this information guide a more practical approach to addressing climate denial? To be frank, we can leverage our understanding of climate deniers to manipulate them. We can learn to walk the tightrope of manipulation, balancing between ineffective and inflammatory interactions. To effectively interact with the more extreme climate deniers, we have to be willing to let go of what we want to say and instead say what is needed to maintain a semi-conservative façade and gain the prerequisite trust and respect necessary to have a more holistic influence over the denier. We can partially camouflage ourselves in some of their values, without showing them our cards, to hold their ear for perhaps long enough to begin to dissolve some of their anti-environmental and anti-climate stances. Communicating with climate deniers requires putting on a disguise and a more tolerant mindset. Once they believe you don't stand firmly on the other side, you can communicate how climate change is affecting their way of life, how it threatens things they value and enjoy, what their future would look like under a business-as-usual scenario, and how the necessary changes do benefit them.

Once this "I'm on your side" dynamic has been established, deniers no longer view you as an adversary and have less reason to construe your concerns and statements as combative. You can then begin by highlighting some concerns about climate change that are more likely to resonate with the denier rather than your primary concerns. For example, you can express your concern for the threat climate change poses to the livelihoods of rural Americans. The Southeastern U.S. will experience decreases in crop production and GDP due to climate change, and if our emissions continue unabated, the damage inflicted on the region will be even more severe.[121][122] However, the conversation doesn't need to cater purely to the concerns of the denier. If you want to get more personal when expressing how you and others are impacted by the changes around us, why climate change is important to you, and how climate change has affected things you value or enjoy, it is likely to be more fruitful when you can connect with a denier over a common interest, such as a passion for the outdoors, whether in the form of hiking, fishing, hunting, or more general

recreation.

For example, I am an avid hiker, and I often share what I have witnessed in our changing forests and how this has shaped my perspective of what we might expect will be left for future generations. From east to west, ecosystem decline is evident throughout our forests and other landscapes. These are not subtle changes revealed only through the rigors of science; they are dramatic changes that jolt basic human intuition. I find this decline deeply saddening and something that should be important to anyone who enjoys spending time in the wilderness, whether they are a sportsman, a conservationist, or a casual recreational visitor. Climate change is placing all kinds of new pressures and stresses on flora and fauna. In my short lifetime, I have noticed alarming declines in insect and plant biodiversity, and many other changes. Even the most remote ecosystems within wilderness still inaccessible to humans are being disrupted. At the end of my lifetime, I wonder if there will still be places we can witness nature in its full glory or if we will be left with disturbed and degraded ecosystems that only hint at the delicate complexity afforded by the stable conditions of the past.

In early May of 2022, I was lucky enough to be in Yosemite National Park around my birthday. On my big day I seized the opportunity to take a 25-mile hike behind Half Dome to Cloud's Rest and beyond. It was clear to me the entire area of highland Sierras was struggling to persevere through years of warmer, dryer conditions. The snowpack in Yosemite increases through the winter, typically reaching its maximum depth in mid-March. I went on my excursion at the beginning of May, so I was anticipating some snow and the possibility of not reaching Cloud's Rest. Even though it was still early in the season, no snow was left by the time of my highland trek. Everything was concerningly dry and much of the vegetation seemed to me to be extremely vulnerable.

From the top of Cloud's Rest, I could see the barren landscape left behind by the Meadow Fire in 2014. The Sierra mountainsides had been scorched so severely by the fire that the ashy forest floor was still devoid of plant life and covered in charcoal stalagmites nearly a decade later. Periodic wildfires are a natural phenomenon and can promote ecological health, but today's fires are burning so hot it destroys the soil and everything in it, preventing natural forest regrowth from occurring. Many species of trees and plants depend on fire to release seeds and activate germination. Under normal conditions, seedlings emerge in abundance within the first five years after a blaze. Under hotter, dryer climatological conditions, western forest ecosystems are struggling to recover and survive and are being converted into shrubland. Some areas have become too dry for seedlings to take hold and reach groundwater. Seedlings are getting baked out

before maturing enough to resist harsher conditions. Western forest regeneration in general is threatened, and in many areas, the most mature trees have outlived their ability to reproduce in today's climate.

There are many signs of change in Yosemite. Thousand-year-old sequoias are being toppled by extreme Mono wind events and the National Park Service is having to use sprinkler systems to prevent their foot-thick bark from being completely incinerated. Most leave the breathtaking landscape of Yosemite with an enhanced appreciation for our world's natural wonders and an enhanced desire to preserve these gems. This is a non-partisan affair true of many of our national parks which are visited each year by millions upon millions of Americans. We can find common ground in our great national parks, national forests, and other conservation areas and wilderness preserves. Many climate deniers would very much like their children and grandchildren to experience the wonder and beauty of Yosemite, Great Smoky Mountain National Park, and other national parks, conservation areas, and wilderness areas in their current condition.

Stories can play an important role in communicating effectively with deniers. Not only are stories more colorful, but they are also typically perceived as less combative and can prompt positive emotional responses that leave lasting impressions. Every now and then I'll encounter a situation where it seems fitting to share some interesting meteorological history, knowing a climate denier or skeptic is present and listening. We can share tangible examples of the past that may change someone's perspective of what they consider climatologically normal in their hometown. My hometown, St. Louis, MO, has one of the longest sets of temperature and precipitation records in the U.S., as well as a rich history tied to documented weather events.

In the 1800s, St. Louis regularly experienced extended periods of cold winter weather that froze the Mississippi River solid. Before Prohibition, in the early 1900s, it was illegal to sell alcohol on Sundays in St. Louis. The frozen Mississippi, where neither Missouri nor Illinois could enforce liquor laws, became a popular place to buy liquor from opportunistic vendors who set up stands to sell booze. Throughout my lifetime in St. Louis, I have never seen the Mississippi frozen solid. I have also not experienced anything comparable to the harsh winter conditions my ancestors faced.

My great, great, great grandfather, George Luhr, was an immigrant from Dierberg, Germany. He came to the U.S. in 1850 and settled in Monroe County, IL across the river from and south of St. Louis. In January 1873, George was making his way home across the countryside when he and his horses were caught

in a blizzard. It snowed so hard he had to get off his wagon to lead his horses and keep them on the road. It was so cold that his legs got frostbite and gangrene later set in after reaching home. George died because the blizzard paralyzed the entire area and there was no way to reach a doctor. Unwilling to risk exposure to minus 20-degree temperatures, let alone navigate through the feet of snow covering the winter landscape, our family did their best to give George a proper burial. The specifics of where and how George was laid to rest are unknown.

Others in the Midwest also suffered during the January blizzards of 1873. Deep snow drifts completely suffocated cattle, halted trains and buried them for days, and stranded smaller communities. Many people died, and some were not found until the snow melted in the spring. In the 1870s, German populations of the rural Midwest used the word "blitzartig," meaning lightning-like or quick as a flash, to refer to these and future winter storms. The translation from "blitzartig" to "blizzard" followed naturally and the use of the word blizzard, in the meteorological sense, did not gain wide acceptance until shortly after 1873.

Ask any St. Louisan if they have walked across the Mississippi or seen snow stop a train, and they'll think you're mad. Things are different now than they used to be. It is, of course, not scientifically robust to use a singular weather event as proof of climate change, but stories of bitter winters past in regions unlikely to see winters like those again may leave a lasting impression on some individuals. I challenge you to learn about the meteorological past of your location and how it is connected to your area's history.

It can be extremely frustrating to see so clearly the current impacts of the changing climate yet have to interact with individuals unable to recognize the signatures of these changes, but we must be patient. Tackling climate denial is a long-term project; our persistence will benefit us all. We also can benefit from being creative and experimenting with unorthodox methods of influencing deniers to figure out what works and what doesn't.

For example, our certainty in what is causing climate change has caused us to respond by working for decades to transform our global infrastructure and supply chains to achieve zero net emissions by mid-century. In some instances, elucidating the current level of industry momentum can lead to more amicable, productive conversations with deniers. For some deniers, it may be worth walking them through a process of abductive reasoning to infer climate change is happening as an explanation for the infrastructural and technological transformations taking place. For example, after observing society is discontinuing the use of fossil fuels, we may abduce global warming to be the reason. If climate change weren't happening and wasn't caused by our use of

fossil fuels, we'd continue using fossil fuels. We're not continuing to use fossil fuels; therefore, climate change must be happening. You can try to get the denier to dwell on this. Depict the clean energy technology industries as colossal industrial forces in motion resulting in more jobs and energy security for the world. This is not an exaggeration. Within the electric power generation sector in the U.S., renewable energy jobs have already far surpassed fossil fuel employment, outstripping the number of paychecks provided by the fossil fuel industry by roughly three to one.[123]

I've found great success in emphasizing the massive job opportunities and benefits for local communities offered by renewable energy. I've also found success emphasizing that technologies such as renewable energy and electric vehicles give us a great amount of freedom and liberty. We now have the freedom to produce our own electricity, provide our own fuel for our vehicles, have fuel price certainty and energy security, and freedom from the inflationary effects of oil dependence. Renewables enable us to be so much more self-reliant. Mentioning all of this will appeal to the values of the denier and show them how the necessary changes offer them something exciting that maybe isn't worth voting against.

You never know where these conversations are going to end up. It's not worth your time to debate whether or not climate change is actually happening or what the cause is. Stay away from that and focus on the fact that regardless of the reasons the energy transition is occurring, and the rate at which we adopt clean and low-carbon technology, there is something in it for the denier and their community, both now and in the future. If the conversation with the denier degrades into having to confront their pure denial, there are a few things you can say that may be effective. At the very least the following kinds of statements may catch the denier off-guard or strike a certain chord.

"One of my friends didn't believe in global warming until her friend showed her a simple at-home experiment using vinegar, baking soda, and a few common household items to observe the warming effect of CO2. We don't need all these fancy satellites and computer models to see the greenhouse effect in action."

"I'm glad we have at least some greenhouse gases. The Earth's average surface temperature would be a frigid 0°F without them, in contrast to the current average surface temperature of about 59°F. We should be thankful for greenhouse gases, but not an excess of them."

"Venus is the hottest planet in our solar system even though it is further away from the Sun than Mercury. The average surface temperature of Venus is a

hellish 900°F because the planet's atmosphere is 96% CO_2. Venus actually shows global warming."

"It's kind of terrifying to think that we are literally breathing in more carbon dioxide than we used to."

"One of my friends has figured out a lucrative side hustle. He's been betting on annual average temperatures. If this year is warmer than average, others must pay him $100, but if it's cooler, he pays them $100 *and* a bottle of bourbon."

With time and practice, we can greatly enhance our ability to analyze climate denial and work around counterarguments to affect persuasible deniers. I encourage you to explore the work of others committed to understanding climate communication and the psychology of climate denial. There are a variety of personality traits and belief systems common among deniers that can be exploited. The only way to exploit them effectively is to continue to do your homework and stay on your toes. Be aware of the most common counterarguments so you aren't thrown any curve balls. Learn how to adapt and command the conversation. Standing your ground will earn you respect.

I truly believe that within a couple of decades, the insulated 12% of U.S. citizens who doubt global warming is happening and 8% who dismiss climate change altogether will be virtually extinct. And by extinct, I mean affected by climate change so directly and to such a magnitude as to have altered their perspective entirely. Unfortunately, for some, today's extreme events aren't clear enough. By mid-century, however, the effects of global warming will likely be so evident that many who currently reject climate change may very well be contributing to efforts to restore the balance of the climate system. As the century progresses, more and more climate deniers, whose ideologies are often more reliant on firsthand experiences, will assimilate the tragic events brought about by climate change into their worldview. Their perspectives will change, and they will no longer believe uncertainty surrounds the climate "debate." They will finally *know* rather than *believe*.

Hopefully, this paradigm shift occurs before the Southeastern U.S. experiences the significant decreases in crop production and GDP that climate change will inflict upon the region. Hopefully, this shift takes off before the insufferable loss of forest in the Western U.S. as fires permanently reduce further expanses to shrubland. One of our many goals as climate warriors today is to expedite the dissolution of climate denial, supplementing the organic process of climate change itself altering the perspectives of deniers. We can identify the

approachable individuals who are in denial about climate change, whether because they are stuck in the grips of active disinformation campaigns, closed social circles, or personal inner battles, and help hasten their transformation not into 'believers,' but into 'knowers.' Never entertain a climate denier when they ask if or why you "believe" in climate change or global warming. Simply respond, "I do not *believe* in global warming. I *know* in global warming." Belief is suggestive of uncertainty, of which there is none.

[xii] *In the Bible, Genesis 1:27-28 (New International Version) says: So God created mankind in his own image, in the image of God he created them; male and female he created them. God blessed them and said to them, "Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish in the sea and the birds in the sky and over every living creature that moves on the ground."*

Total annual savings from the Actions in Series 3:

680 kg CO2e

4.3% of the average American's footprint

It is possible some Americans remain unconvinced of climate change because of our addiction to heating and cooling, which insulate us from the ambient conditions of Mother Nature. Many have escaped the elements altogether, enjoying a blissful, steady year-round temperature no matter the extreme conditions outside or the expense of utility bills. Heating has existed for a long time—ever since man discovered fire. Cooling systems, however, did not begin to hit the markets until the 1930s. By the end of the 1960s, most new homes in the U.S. had central air conditioning. Today, over 90% of American homes have air conditioning.

There are a wide array of measures you can take to dramatically improve your home's ability to efficiently maintain a comfortable temperature, although many are not included as actions in this series. Some of these measures include using outdoor vegetation to block the most intense rays of light striking your home during the summer months, using light-colored window shades and draperies to reduce heat gain during the summer and leverage passive solar heat gain during the winter, painting your home a light color if you live in warm climates and dark if you live in an area with a long cold season, adding insulation to your attic, locating your home's thermostat wisely so it accurately measures the temperature in the main area of your home, closing the vents and doors in unused spare bedrooms, and more.

By reflecting on your usage of heating and cooling and testing your limits of comfort to reduce your energy consumption, you can drastically reduce your impact on our climate while gaining a renewed appreciation for the impacts of comfort on our warming world. Here are a few ways you can reduce the emissions generated from your use of heating and cooling.

Action 12 – Replace your HVAC filter at least every three months.

Nearly half of your total energy consumption at home is for heating and

cooling air so that you can enjoy a comfortable and relatively steady temperature year-round. Since your heating, ventilation, and air conditioning (HVAC) system accounts for such a large share of your energy usage and annual greenhouse gas emissions, it is very important to become mindful of how your preferences for comfort impact your bank account and the world around you. It is also important to understand how to maintain your HVAC system.

Your HVAC system has an air filter responsible for maintaining healthy indoor air quality. This air filter collects dust and other particulate matter, providing cleaner air. If you don't change your air filter frequently enough your air filter can become clogged with debris. You may then start to notice dust collecting in your home and see an increase in your utility bills due to your HVAC system having to work harder to force air through the filter. At a minimum, you should check to see if your air filter needs replacing once every three months (and perhaps more frequently during the peak heating and cooling seasons). This will improve the energy efficiency of your HVAC system. Set a calendar reminder, enjoy clean air, and benefit from the savings. The annual impact of committing to Action 12 is 60 kg of CO2 (0.4% of your annual emissions).

Action 13 – Reduce air leakage by sealing up your home.

Effectively sealing air leaks in your home can significantly reduce energy consumption. In many cases, all the tiny gaps in a home's walls, ceiling, floor, and ductwork can add up to have the same effect as leaving a window wide open throughout the year. This lets much of the energy used for heating and air conditioning go to waste. Caulking, sealing, and weather stripping all the cracks, seams, and openings to the outside of your home can reduce your total HVAC energy demand by over 15%, and perhaps by as much as 30%.[124][125][126]

There are multiple ways you can test for leaks around your home. One method is to wait for the next windy day (when there are significant pressure differences around your home) and use a smoke pen or incense stick to identify locations of air leakage. Shut off all ventilation and equipment that causes air movement in your home. Hold the smoke next to your windows, doors, exterior wall/ceiling fixtures and electrical outlets, and other locations of suspected air leakage to see if the smoke travels horizontally. This likely means that the spot needs to be sealed.

You can lookup how-to videos for caulking windows and doors, installing foam gaskets behind wall switch plates and outlets, installing weatherstripping on doors, using foam sealant on larger gaps, installing chimney balloons, and more.

If you really want to take this action seriously and ensure you minimize the air leakage of your home, hire a weatherization professional to conduct a diagnostic pressure test and identify the locations and amounts of leakage. Professionals can then use this information to target leaks around your home. The annual impact of Action 13 is 170 kg of CO2, or 1.1% of the average American's annual emissions.

Climate Warrior Stretch Goal: Hire professionals to conduct a whole-home energy audit and make improvements to increase the efficiency of your home.

Action 14 – Let your home fluctuate between 60 and 80 °F.

Action 14 is one of the most important actions. As you may have learned while taking a cold shower after reading the series on water heating, sometimes we must confront and overcome our habits using sheer willpower. Most Americans enjoy keeping their indoor air temperature around 70°F year-round. This is one of the many things that make us Americans unique compared to the rest of the world. In fact, from the perspective of most humans, we have a bizarre intolerance for temperature change and an obsession with air conditioning. Allowing your home's temperature to swing with the weather is a great way to cut back on your personal emissions. Sure, you might be slightly warm or slightly cool at times, but this enables us to leverage other inventions, such as sweaters and fans.

When it is hot outside, set your home's temperature to 80°F to save energy. You can even let your home get warmer, especially if you are gone during the day. Similarly, during the winter, especially during cold spells, you should reduce your home's temperature to 60°F. If you're fine with bundling up, you can let your home get even cooler to save more energy and emissions. Inevitably, there will be extreme weather scenarios that warrant putting your HVAC system to work. Realistically, you can let the temperature of your home swing from 60–80°F throughout the year, maintain a high level of comfort, and save loads of carbon, not to mention money. For every additional degree warmer or cooler you allow the temperature of your home to fluctuate with hot and cold weather, you save roughly 3–5% on total HVAC energy consumption.[127][128] By letting the temperature swing, most Americans can achieve a 30–60% reduction in total annual HVAC energy usage.[129][130][131][132] Even after accounting for the savings from actions 12 and 13, the annual impact of committing to Action 14 is 450 kg CO2, or 2.8% of your annual footprint. This amount of CO2 is enough to fill three houses from floor to ceiling.

Climate Warrior Stretch Goal: Only use your heating and cooling systems during periods of extremely cold and hot weather.

CHAPTER 9 ~ A MESSAGE FROM A CENTENARIAN

My name is Carolyn Wright. I have now lived within a stone's throw of a century. The changes in my long life are astounding. These changes stretch from my Grandparents showing up at our house in a horse and buggy to astronauts exploring space. My Grandson, Eric, the author of this book, has asked me to share my views as I look back over my lifetime.

I grew up in a rural area of southern Illinois, so my experiences were different than those of people living in the city. One of my very first memories is waking up in the morning with a very cold nose. Our house was heated with a coal-fired furnace and the heat only reached the first floor. Upstairs, the bedrooms were freezing. The goal was to grab clothes and get downstairs as quickly as possible. We did not have electricity. Thomas Edison was not only credited with inventing the light bulb, but also a system for electric distribution between 1879 and 1881. Electric distribution developed quickly in the cities, but rural folks were completely left out. This meant no electric lighting, refrigeration, electric washers, or other amenities. Also, no indoor plumbing. That early morning visit to the outhouse was a rude awakening. Rural life in the early 20th century was very "hardscrabble." This did not change until 1936.

In 1932 Franklin Roosevelt was elected president. He wasted no time trying to deal with the horrors of the Great Depression. His "New Deal" involved a series of public works projects to get people back to work, needed financial reforms, and programs to reduce the suffering of vast numbers of our population. Few people escaped the effects of the depression, including my family. Our saving grace was the fact that living in the country made it possible for my parents to raise almost all of our food, so we did not go hungry. Another saving grace was the Rural Electrification Act of 1936 which was part of the New Deal.

By 1936, electric cooperatives were being established in rural areas all over the United States. Federal loans were extended to these power co-ops to run electric lines into rural areas of the country to get power to farms and small villages. Electricity arrived in our tiny village in 1936. It was a very big deal, and people were so grateful. Even then, conservatives of the time opposed rural

electrification, as it was called. They claimed that it gave the federal government too much power. Some things never change. For this little kid, it meant cold milk, homemade ice cream, Jell-O, and other cold desserts. It meant food could be preserved much longer. It also meant electric lights and heaters so I didn't have a cold nose every morning. It meant my mother didn't have to labor as hard to keep our household functioning. It was a huge blessing!

I mentioned that families in rural areas grew most of their own food. My Mother had a huge garden, and my Dad took care of a large orchard. Canning of produce went on throughout the summer. It was a labor-intensive operation picking, cleaning, and processing food in the heat of summer. Of course, at this time there was no air conditioning. That came MUCH later. Flour, sugar, coffee, spices, etc. were bought at the store, but most of our food was raised by the family. Hogs and poultry were butchered for meat. There was no waste. Kids were taught to eat what was on their plate and be grateful for what they had. Scraps were fed to the dogs, cats, or hogs. Most clothing was homemade and then repaired and remodeled to be passed down to smaller kids in the family. Shoes and coats were bought large so they could be worn longer as kids grew. There were no landfills for waste. Items were used, re-used, and re-purposed until they were completely worn out. Anything that couldn't be consumed was burned. Anything that couldn't be burned was buried in a pit on the property. Plastic, the bane of today's society, which is currently destroying our oceans and our environment, had not yet been invented. Fertilizer for the fields was manure from hogs, chickens, and cattle.

Entertainment centered around nearby family and friends. Card games were popular, and every weekend there were gatherings accompanied by much noise, laughter, and arguing over the games. Outdoor games were also popular in good weather. Radio was a great source of entertainment with news, comedy shows, mysteries, and music. There was no television until about 1950 so people chatted and "visited" with each other. During the depression, people had to make their own entertainment due to a lack of money. During World War II the same thing was true due to gas rationing and wartime austerity. Noses were not stuck in electronic devices and cell phones constantly, so people interacted face to face. Telephone conversations were somewhat restrained since we had "party lines" with several households on a single line. People could listen to every conversation on the line if they so desired.

Items such as old appliances, farm equipment, and cars that were beyond saving were a problem. The area where I grew up and still live has what is known as karst topography. There are large sinkholes everywhere, and they became the

dumping ground for all items that could not be disposed of any other way. In lieu of a dump or land fill, the sinkholes became dumps. This turned into a huge cleanup operation for later generations. Some of the items dumped in the sinkholes were toxic. The sinkholes drained into the underground water system from which well water was accessed, so this practice created huge problems as time went by. With this exception, the amount of waste created in the early 20th century was negligible compared to today.

Massive consumption and massive waste were not a part of life during the Great Depression or World War II. During World War II we lived with rationing of many everyday items. Everything from steel, rubber, copper, cotton, and gasoline to sugar, cocoa, butter, and other food items went to the troops. Worn-out equipment, old tires, and discarded metals were collected and re-used to manufacture war goods. This country pulled together as it never had before and never has since. Even children helped in any way they could. Civilians sacrificed without complaint and used any extra money to buy war bonds to help pay for the war.

At this point in our country's history, there were no shopping malls, no supermarkets, no big box stores, and no unsightly strip malls EVERYWHERE. Towns and big cities alike had downtown shopping areas where people went. Within a relatively small area it was easy to find whatever was needed. Shopping areas were compact and didn't eat up thousands of acres over the entire countryside as they do today.

By contrast we could call this the "Age of Consumption." There are many shopping malls that are now being closed. Many big box stores have had to close also. Sears, Macy's, and others are closing in many areas. We now have more malls, big box stores, and strip malls than we have offline shoppers. Thousands of acres of land have been paved over to the detriment of the environment and now sit empty becoming eyesores as it all slowly decays.

People are frantically shopping for things they don't need, piling up goods they don't use, and eventually giving or throwing it away. There is so much waste that Goodwill and the Salvation Army can't possibly use it all. 85% of unwanted clothing ends up either in landfills or baled up and sent to various African nations.[133] There, some of it is re-used, but the vast amount is burned. The same is true of used electronics being sent from rich countries to poor countries. Some of it is processed to be re-used, but again much is burned, creating toxic fumes. But we still buy more. That just seems crazy to a child of the depression.

Conspicuous consumption, which has become a way of life, is a detriment to the well-being of people economically. It is a waste of natural resources,

destructive to the environment, and a threat to the future. It seems that recycling has greatly declined for many reasons. We throw away more than can be recycled. Many items used today can't be recycled. Many people don't want to bother with recycling at all. Many items made are toxic. Plastic is so entrenched in packaging and products that it is destroying the oceans and ocean life. In my view, plastic is one of the worst inventions ever conceived. There are many others, but plastic is near the top of the list. What did we used to wrap things in, you ask? We wrapped items in newspapers, waxed paper, or in the case of items such as coffee, animal feed, and flour, in cloth bags. Paper bags were also used.

Instead of making most of the items we need in this country as we used to, we now import most of what we need from China and other countries. As of 2022 we are living with a distribution nightmare. Goods used to be moved primarily by train. I don't know who thought that moving to the distribution of goods by semi-trucks instead of trains was a great idea. It has become an environmental disaster on so many levels. Ships spewing toxins into the air are sitting in ports waiting to unload. Trucks spewing toxins into the air are sitting at docks waiting to be loaded. Those same trucks spewing toxins into the air are hauling everything we use to stores and shopping centers all over the country. In addition to all of the pollution involved with this system, these huge trucks clog up traffic and tear up highways.

My father was a businessman, and when his business finally grew during and after World War II, everything was shipped by train to a nearby depot. He was then responsible for transporting the items the short distance from the depot to his place of business. Every town of any size had a depot as part of the distribution system at that time. The switch from train to truck distribution on such a large scale has greatly contributed to both congestion and environmental problems.

I don't mean to imply that life was perfect during the early- and mid-20th century. People dealt with very serious problems, as I have noted above. Medicine advanced greatly during the 20th century. Many lives were saved that would have perished in earlier days. I do believe there was a greater feeling of unity. A greater common-sense approach to problems, as well as a spirit of "all being in this together." That attitude seems to have shifted to self-interest and the firm belief that I am right and everyone who doesn't agree with me is wrong. Cooperation seems to be a thing of the past.

I want to shift from changes in our everyday lives to environmental issues. Dramatic changes have taken place from the early 20th century to now. The first far-reaching environmental law passed was the Migratory Bird Treaty Act of

1918. By the early 1900s waterfowl, birds of prey, and other birds with brilliant feathers were nearing extinction. Their feathers were used for fashion and to decorate clothing items. Herons, egrets, members of the parrot family, small brightly colored birds, and sometimes entire stuffed songbirds were used to embellish women's hats. In the case of the Birds of Prey, they were used for target practice or because they were viewed as pests.

In addition to the slaughter of birds, many animals were hunted to near extinction either for the fur trade or for sport. When I was young, there were no deer, otters, wild turkeys, or beavers in Illinois. They had been completely wiped out by uncontrolled hunting. By mid-century, eagles and other birds of prey such as peregrine falcons were gone from most states. One had to travel to Alaska to see our national symbol, the Bald Eagle. Without the Migratory Bird Treaty Act of 1918, and the Endangered Species Act of 1973, there is a likelihood that all wildlife in this country would now be nearing extinction or gone entirely. Of course, wildlife is still greatly threatened by pesticides, traffic deaths, loss of habitat, power lines, and other dangers. In 2019, research done by the Cornell Lab of Ornithology found that the North America bird population had experienced a 29% decline since 1970.[134] I firmly believe that the two above mentioned laws have greatly improved the chances that many of our fellow creatures will be here for future generations. Obviously, we have a lot to still be concerned about, and now is not the time to weaken regulations that protect wildlife and all of the beauty and joy that nature brings to our lives. I believe that we save what we love. How much do we love our fellow creatures on this earth? How much do we love the beauty of nature?

I have lived my entire life in an area where there are still oak-hickory forests to be enjoyed. That is the good news. The bad news is the dramatic changes I have seen in my lifetime. The forests have been invaded by aggressive exotic species such as bush honeysuckle, tree of heaven, Bradford pears, and others that have spread dramatically in the past 25 years or so. These exotics are almost impossible to get rid of. The health of the forest is now threatened as the noxious plants soak up the water and nutrients needed by the trees. They cover the forest floor so that tree seedlings do not have a chance to take hold.

As a result of these invasions, bird life has changed also. One of my hobbies for many years has been bird watching. Bird populations have changed from my early years to now. Some birds that used to be common in this area are now gone or very seldom seen. Whip-poor-will, yellow-breasted flycatchers, red-headed woodpeckers, quail, meadow larks, brown thrashers, night hawks, and bobolink, though not extinct, are greatly reduced in many areas. I feel that the

loss of preferred habitat for these birds is the cause of their decline.

On the other hand, some other birds that were not here previously are now showing up, particularly birds of prey. Bald eagles, Mississippi kites, and a variety of hawks are now here in the immediate area. I have a bald eagle nest about a mile from my home. The pair has been there every year for the past 6 years or so, successfully raising young. Merlins and peregrine falcons have been spotted in the general area. These are all species saved by the Migratory Bird Treaty Act and the Endangered Species Act. All varieties of owls have increased in numbers. I now have nesting barred owls that have practically become pets. They hang around the woods near the house all of the time. Bluebirds have increased substantially due to the placing of many bluebird houses by citizens who care. Nature is remarkable. Given just a little help, nature responds quickly. The animals really don't ask for much, just to be given half a chance. Any helping hand, no matter how small, makes a difference. The right plants in your yard or a larger lot will bring species in for you to watch and enjoy. The typical American lawn offers nothing for wildlife. We can greatly expand the area of native prairies and forests in the United States. It is just necessary for people to care.

I have a variety of bird feeders in my front yard, and I get a large variety of songbirds year-round to enjoy. The spring migration is a special treat, since species that are not here on a regular basis stop at my feeders to fill up before moving on. Yes, my front yard gets a bit messy. Believe me, it is more than worth it for the joy and fascination of watching the interaction of these beautiful creatures. A word of warning, it is necessary to watch out for cats. They are responsible for killing *billions* of birds annually. My cats have all been indoor pets, and they were just fine living indoors and doing their bird watching from the windowsill. Strays can be caught in cage traps and taken to the humane society. It doesn't work to enjoy bird watching and have outdoor cats at the same time. If you do, you are simply setting a convenient dinner table for the cats.

Deforestation is a critical problem worldwide. Tropical and temperate forests are the lungs of the world. They breathe oxygen into the atmosphere and absorb carbon dioxide. They help cool the earth. In my travels, one of the most shocking sights I experienced regarding forests was the vast amount of clearcutting I saw driving through the northern part of Washington. The signs stating that reforestation was in progress were not that comforting since the only thing being replanted were pine trees. The great diversity of the original forest was completely ignored. In my view, that smacks of dishonesty. I am very fortunate that the forest land in my immediate area has not been logged.

What happened to the night sky? As a child and young woman, I could

look up on any clear night and see the gorgeous arch of the Milky Way galaxy painted across the sky. The sky was also vibrant with a blaze of light from many millions of stars. It was beautiful beyond description. I still live in the same area, but now I look up at the night sky on a clear night and see the moon and so few stars I could count them. I still live about 22 miles from downtown St. Louis as I did then. Air and light pollution have practically erased the beauty of the night sky.

At this point in our history, I think that land preservation is more important than ever. As the population grows, we need some wild places where people can get out and enjoy nature. The progress on that is very uneven. In this area, progress has been made within the past few years. We have three sizeable preserves with walking trails, prairie meadows, and beautiful scenery. There is an additional preserve being developed. Unfortunately, nationally we see one administration do much regarding land and water preserves, and then the next administration reverse the progress made. Nationally, our most beautiful places must be preserved because once they are opened to drilling, mining, development, or clearcutting, they are gone forever.

We humans can scream at each other, live in denial, and blithely ignore what is happening as weather becomes more erratic and violent. We can say that the melting glaciers are not a problem. Rising ocean levels are a myth. Increasing worldwide temperatures are imaginary. We can happily bury our heads in the sand. Mother Nature doesn't care. Mother Nature lives by her own set of rules. Mankind has spent over a century and a half abusing the environment. Mother Nature can deal with a certain amount of abuse, but there is a tipping point. We are fast reaching that tipping point whether we want to admit it or not. When Mother Nature has had enough, WATCH OUT!

Total annual savings from the Actions in Series 4:

1,960 kg CO2e

12.3% of the average American's footprint

Our post-World War II economy is based on mass consumption. Industrial mass production on today's scale is only feasible if consumption is relatively steady and the population uses borrowed money to pay for things over time. We are living in a crisis of overproduction to meet demands for products that aren't needed. It is advantageous for businesses to leverage advertising and marketing campaigns, psychological principles, propaganda, and other means to pressure the public and promote overconsumption. The culmination of all this pressure and manipulation is apparent today when looking at the aggregate characteristics and behaviors of the American population, which over time has mutated into the most wasteful, unquenchable consumer culture on the planet. We are constructed beings manipulated by industrial and corporate interests.

Recall what was discussed earlier in this book about the mindset of a sustainable civilization. If you were surviving alone in the wilderness, away from modern manufactured realities and the social constructs of the industrialized world, you wouldn't waste your time and energy on unnecessary or counterproductive things. By living beyond our means, we commit ourselves to a future of labor with less time for spiritual, educational, creative, and social pleasures. We must decouple our sense of wholeness from materialism and begin focusing more of our time and effort on the activities that will in the future truly benefit us. Right now, our future needs reduced consumerism, and that is the best personal behavioral change we can make for our environment. Here are some practical ways to reduce your consumption and footprint.

Action 15 – Avoid single-use bottles of water and soft drinks.

The average American consumes roughly 100 gallons of bottled water and soft drinks annually.[135][136] This might change if everyone knew that a large portion of bottled water is just municipal tap water, the health regulations for bottled water are less stringent than for public water sources, and certain bottled

water companies sometimes exploit valuable water resources in regions where freshwater is scarce.

Certain advocacy organizations claim the bottled water industry is energy efficient. This couldn't be more deceptive. Producing bottled water and soft drinks is an unnecessary, energy-intensive process. When considering the energy required to source, manufacture, package, transport, chill, and recycle or dispose of bottled water, producing the same amount of municipal tap water would require roughly 100 times less energy (or even less) and come at a fraction of the cost.[137][138][139][140] As for soft drinks, why not eliminate a habit from your life that you know is unhealthy and unnecessary?

Get into the habit of keeping your reusable water bottle by your side. I assure you it is much more convenient than buying and transporting single-use bottles countless times. If you've forgotten your trusty reusable bottle, you can endure the very beginning stages of dehydration and wait until you reach a tap. You will be rewarded monetarily and with carbon savings. The annual impact of eliminating bottled water and soft drinks from the average American's life is 110 kg of CO2, or 0.7% of your emissions. For many Americans, roughly one out of every one hundred units of CO2 emitted is dedicated to the seemingly insignificant habit of grabbing a single-use can or bottle to drink from. It has to stop.

Action 16 – Avoid single-use bags and shop with bulk food containers.

Americans spend billions of dollars on plastics annually, with the average individual using and discarding thousands of plastic items each year. We take plastic for granted, but plastics are energy intensive. Surprisingly, the amount of petroleum used to produce just a dozen plastic shopping bags is roughly equivalent to the amount of petroleum used to produce the gasoline used to drive a car one mile.[141] In addition to steering clear of plastic shopping bags, you should become more selective with your purchasing habits and avoid food goods that are plastic- and packaging-intensive. Bring refillable containers with you for bulk food and reusable produce bags for fresh produce at the grocery store.

If you do not already own reusable bags, you do not need to buy any. You can tie off a couple of old shirts, use an old duffle bag, or find creative ways to avoid the unnecessary consumption of materials. Some people roll their entire shopping cart full of un-bagged items up to the trunk of their car and unload everything directly into their trunk. When they go home, they just bring out a container to transfer everything into their home. To some, bags are an inconvenience and a waste of time. The annual impact of eliminating single-use

bags from your life and being a little more mindful of the plastics and packaging you consume is easily 30 kg of CO2 (0.2% of your annual emissions), with the additional benefit of freeing our ecosystems of future litter.

Action 17 – Go digital and also minimize your use of paper towels.

The pulp and paper production industry accounts for about 2% of direct industrial CO2 emissions, globally, with additional emissions resulting from degradation of forest ecosystems, and emissions associated with the total lifecycle of paper products, from transport through to recycling or disposal.[142] Americans use thousands of sheets of paper per person per year. The CO2 emissions from producing, transporting, and disposing of paper-based materials weigh twice as much as the paper itself.[143] Think about that next time you are holding a ream of paper or a textbook. Appreciate the weight of that carbon.

Aside from printable paper, Americans have an addiction to other paper products, such as paper towels. The average American household uses more than one roll of paper towels per week and uses other paper towels or napkins to clean or dry their hands dozens of times per week. Each roll of paper towels contributes roughly a kilogram or more of CO2 to our atmosphere.[144] A single hand drying scenario uses several grams of CO2.[145]

Action 17 is all about recognizing the wasteful ways we use paper, whether in the office, in the restroom, or at home. Instead of purchasing rolls of paper towels, use washable rags, hand towels, and cloth napkins. Instead of using paper towels or hand dryers after washing your hands, give them a couple of good shakes and let them airdry for a few seconds. If you must immediately have dry hands, keep a personal handkerchief with you. When in the office or working at home, only print documents that must absolutely be printed. If you need a break from the screen, blue light glasses help you avoid eye strain and prevent unnecessary printing. Additionally, you can reduce the amount of mail delivered to your home by enrolling in digital payment methods or e-billing, and unsubscribing from or having yourself removed from mailing lists. All of these individual actions add up. The annual impact of changing your view on paper and reducing your paper consumption by half is 230 kg of CO2 (1.4% of your annual emissions), or roughly as much CO2 as is sequestered by 40 trees over the course of a year.

Action 18 – Be frugal and only buy quality products you need.

It is time for a heart-to-heart. If you have committed to some, most, or all of the actions up to this point, you should feel a sense of pride and

accomplishment, but there is never an end to what we can do to help fight the climate battle. Being a climate warrior is about developing a killer instinct for how to improve your lifestyle from the perspective of our climate. Now is the time to eradicate trends and norms that are detrimental to the sustainability of our planet. The heart of the climate battle is in your individual decisions and impulses. Your weapon in this battle is yourself, and you are currently fighting for both sides. In the United States, we have developed a subculture of consumerism and waste that has spread across the planet. It is time to slow down and be realistic.

Action 18 is to be frugal and only buy quality products you need. What this means is you must be frugal, and when you do make a purchase be prudent in your decision. By that, I mean minimize what you buy, and when you do buy something, ensure it is a product of quality and longevity. An infinite number of products on the market have been designed specifically to minimize production costs, convey false value to consumers, and inevitably result in product failure that forces a secondary purchase of a similar or identical product. Do not fall for it. Only buy quality products that you know will last. The initial investment for quality products is greater, but you can afford that if you are frugal, and in the long-term, quality is cheaper if you end up avoiding a second and possibly third purchase as a result of something breaking. Purchasing junk products at Walmart, or furniture at IKEA are great examples of nearsightedness—you are only reducing your short-term expenditures, not your long-term expenditures. Often, finding quality products requires searching more locally.

Action 18 is also to reduce your non-essential purchases. Quantifying the carbon reductions for something like this is highly complex and uncertain. In America, the average per capita industrial and commercial greenhouse gas emissions are a combined 8 MT CO2e, or half of your annual emissions. These emissions, along with transport emissions, are embedded in the products you buy. There are extreme climate benefits if you can become more frugal and reduce your non-essential product purchases.

Sustaining the throughput of energy and resources required to support a global consumerist society is not feasible. Non-essential is a broad term and the emission reductions associated with eliminating non-essential purchases cannot be calculated precisely. Regardless, you can rest assured that even a marginal decrease in personal consumer expenditures is healthy for you and the planet. Always ask yourself if you really need something and if your desire for that inanimate something is worth it. If you truly reflect on your consumption decisions, make an honest effort to be frugal, and optimize your non-essential purchases, you can reasonably expect the annual impact of this Action to be over

1 MT. For the average American, the annual benefit of Action 18 is 1,160 kg of CO2, or 7.3% of your annual footprint. For most Americans, this is the most achievable, beneficial, and impactful action!

Action 19 – Resist excessive packaging and recycle.

The reduce, reuse, recycle drum has been beaten to death. A superior alternative to recycling is to resist allowing the materials that should be recycled into your home in the first place. Like resisting plastic bags in Action 16, you should resist all forms of excessive packaging in your purchasing decisions. If you do so, you'll find yourself making fewer trips to the recycle bin and the dumpster. Let's use spinach as an example. There is the spinach sold in those gaudy plastic boxes, and there is also unpackaged spinach. What will your decision be?

As a consumer, your purchasing preferences determine the decisions of corporations, such as whether to use plastic packaging in their goods. Reducing your consumption of unnecessary packaging will send a market signal and will save you pound after pound of carbon dioxide. The plastic- and packaging-intensity of the products we buy has gotten so extreme that corporations, in many instances, are essentially selling packaging rather than the products within their packaging. Have you ever been disappointed by the amount of vacant space inside of a package of food or by the inexcusably low quality of a product wrapped in remarkably attractive and durable plastic? You aren't alone. This should frustrate you enough to say goodbye to the companies selling those illusionary products. Vote with and without your dollar. Purchase products with minimal packaging and avoid junk products concealed by plastic, and we will begin to persuade companies to change their practices.

In this modern era, packaging goes beyond brick-and-mortar stores and extends into online markets. Amazon and other online marketplaces are full of non-essential items wrapped in excessive packaging, which then get wrapped in more packaging to be delivered to someone's door. Resist the clutter and quit promoting companies that go overboard with the packaging. Batteries used to be sold in open containers. You could simply grab the exact amount you needed. Now you must buy a certain number of batteries and cut your fingers off just trying to get the things out. Alternatively, it would be best to get some rechargeable batteries, but that is beyond the scope of this Action. For the purposes of this Action, let's focus only on paper materials, glass, metals, and plastics. If you recycle 90% of each of these categories that make it into your home, the annual benefit relative to the recycling rate of the average American will be 430 kg of CO2, or 2.7% of your annual footprint.[146][147]

Climate Warrior Stretch Goal: Strive to virtually eliminate your disposal of paper, glass, aluminum, plastics, food, and other materials to become waste-free.

Humanity has undergone several major transformations. After striking a flame and developing languages we emerged from the wilderness to discover agriculture, freeing us from the incessant need to forage as hunter-gatherers and enabling us to develop the first cities. We continued to expand systems of shared knowledge and learning, eventually leading to the advancement of scientific disciplines and the industrial revolution. After 200 years of expansion and mass production came the digital revolution. We now live in the information age, during the climate revolution, with an ability to communicate and transform at light speed. Throughout the timeline of our race's history, progress has been exponential. Today's elderly have witnessed this breakneck pace of transformation, having gone from horse and buggy to Tesla, from written communication to FaceTime, and from being among just 2 billion to among 8 billion other humans. There is so much work ahead of us, but at this pace we can only be certain that our future involves markedly transformed energy and social systems.

When thinking about our climate and future, many become overwhelmed and enter a long-lasting slump of pessimism. This is understandable with all we know about the severity of our current situation, but for many, this pessimism transforms into action. Action and engagement are the natural remedies for climate change-induced depression. Climate warriors should remain optimistic because not only are we unaware of tomorrow's technologies that may accelerate this green revolution, but we can reach net zero with yesterday's and today's. It will not be easy to overcome our primitive, million-year-long reliance on fire. However, with all the advanced technology at our disposal, it is only intuitive to assume society will eventually no longer power buildings, computers, and other devices via combustion. Talk about two overlapping eras!

Today's and tomorrow's solutions for reaching net zero are technological, ecological, political, sociological, and biological. We need to work with each other, and for and with our wonderful planet. We must leverage and supplement our planet's ability to adapt and restore balance while accepting our responsibility to take climate action and execute solutions in all sectors. We must rein in humanity's selfish and gluttonous tendencies and transform the norm from

consumerism to sustainability. We warriors must act in concert with one another to stimulate a holistic shift in the mindset of consumers in wealthier, more developed regions. We must reach the other side of yet another major transformation in human history—the green revolution.

I believe we can succeed within the lifetime of the youngest generation. Just imagine what it might feel like teaching the children of the future the history of how our civilization harnessed the powers of nature, the Earth, and the Sun, rediscovering what it means to be humans living in harmony with our planet. Imagine the sense of joy and accomplishment when we reach carbon neutrality and the carbon clock starts ticking backward as we sequester our past emissions back from the atmosphere. The celebration is going to be CRAZY! I certainly would partake in the festivities. For the sake of many more generations of partying, a seemingly infinite to-do list remains. This chapter provides a high-level overview of some of the many fascinating measures key to this great transition. Here are several developments at the center of our effort to reverse global warming.

Wind

Harnessing the power of the wind is one of the major pillars of our current plan to halt global warming. For millennia, we have used the wind for transportation, carrying us up rivers and across seas. The power of the wind has also been harnessed to process grains and pump water, at one point being the dominant source of energy in rural America before the internal combustion engine and the electric grid expanded to reach even the most remote farms. As our emissions continue to alter global wind patterns, we must continue to harness this vast resource to reduce our emissions.

The woven-reed blade windmills of Persia and the Middle East, the traditional Dutch windmill, and all past windmills are dwarfed by modern wind turbines. Many do not realize the true enormity and power of the world's largest new wind turbines. The behemoth offshore wind turbines on the drawing board today are nearing the height of the Eiffel Tower, with just a single turbine capable of providing power to 20,000 homes and a single rotation of the blades meeting the daily electricity needs of two homes. Offshore wind energy is a promising climate solution for many reasons. Not only does the smooth surface of the ocean provide a faster and more uniform wind resource than on land, but more than one-third of our global population lives within just 60 miles of an oceanic coast.[148][149] Offshore wind energy alone has the technical potential to match total global electricity demand but the industry is still in the very early stages of

implementation in most regions.[150]

The challenges for offshore wind development are primarily a matter of sheer scale. Massive, specialized oceanic vessels are needed to handle and install offshore wind turbine components, as the individual blades themselves can be as long as a football field and can only be manufactured, delivered, and installed in one whole piece. There are very few companies with the technical and financial capacity to break into the offshore wind installation business, and there are only a few dozen wind turbine installation vessels globally, with the U.S. still building its first vessel as of 2023.[151][152]Another challenging aspect of offshore wind installation is that the structures extend underwater and must be secured to the ocean floor with very robust foundations. For this reason, bottom-fixed offshore wind facilities must be installed close to shore in shallow waters. However, the offshore wind industry may be freed from bottom-fixed designs by leveraging floating offshore wind systems to access even windier areas over deeper waters. Floating offshore wind is considered by many as the next major breakthrough in renewable energy.

For population centers located further from coastal areas, onshore wind energy is often an attractive solution. Combined, onshore and offshore wind energy already provide an impressive amount of electricity for many nations. In 2022, wind energy represented over 20% of total electricity consumed in Germany, Spain, the United Kingdom, and Uruguay, to name a few, while roughly 10% of the electricity generated in the United States and China came from wind.[153] Although the vast majority of wind energy installations are for large, utility-scale applications, which have locational constraints, there are some interesting developments in the commercial and residential wind energy space allowing for micro wind turbines to be installed on-site to power homes and businesses directly. There is a great variety of designs for micro wind turbines, many of which can be elegantly incorporated into architectural environments.

Wind energy is practical, reliable, and here to stay. We are harnessing the kinetic energy of the Earth's atmosphere as one way of preventing its pollution. Looking beyond the sky to the Sun, solar power is another major pillar of the transition to an emissions-free world.

Solar

Ultimately, all of the energy in the fossil fuels we consume today is derived from sunlight that reached the earth millions of years ago—sunlight that was photosynthesized by plants and plankton and transformed beneath the surface of the Earth. Today, rather than using the prehistoric stored energy of the

Sun, we can harvest the power of our star in real time. Currently, more solar is being built than any other technology type in the power generation sector in the United States, accounting for roughly half of all new electric generating capacity. [154] It is indeed time for mankind to free itself from the primitive habit of lighting a fire to meet its needs and achieve the millennia-old dream of harnessing the energy of our star to power our civilization. Doesn't that just sound so much cooler?

The vast majority of solar energy systems installed globally are solar photovoltaic (PV) systems. These systems are comprised of many individual solar PV panels, which are made of several individual PV cells. The cells are made of a semi-conducting material that absorbs photons, the tiny energetic particles that make up sunlight, which dislodge electrons from the atoms in the semi-conducting material to produce direct current electricity. Solar PV is a highly modular technology, and there is virtually no limit to how big or small a solar PV system can be or where it can be installed, making it the ideal technology for homes, small businesses, and off-grid power applications.

Small-scale, or distributed, solar adoption is becoming even easier as component prices continue dropping to irresistibly lower levels, as the residential and commercial solar industries establish a greater presence, and as new business models take hold. Local and federal incentives further increase the savings from going solar. Additionally, you don't have to have the money on hand to install solar on your rooftop. Third-party companies offer loan, lease, and power purchase agreement (PPA) options, taking on the risk of investing while sharing value with the homeowner.

As an alternative to going it alone, there are programs popping up all over the world offering community-based and crowd-sourced financing of renewable energy. Programs such as community solar, shared renewables, community choice aggregation, and virtual net energy metering enable you or your community to opt in, lease, purchase, or subscribe to renewable energy resources. This is yet another avenue for helping the environment and avoiding guaranteed increases in electricity costs. Furthermore, if you are among the majority of Americans who live in a region with a deregulated electricity market, you can often select your electricity provider based on how renewable they are, thus dictating the type of energy you are financing. Deregulated state electricity markets allow for retail competition, whereas regulated state utility markets preserve government-sanctioned monopolies that are largely insulated from market forces. The names "regulated" and "deregulated" can seem counterintuitive because the term "regulation" is generally associated with

environmental standards and pollution reduction programs, but in states with *regulated* electricity markets, it is illegal for someone to build a solar array or wind farm to sell electricity to the surrounding community if it encroaches on the territory of an investor-owned utility. Only the electric utility monopolies can do that in regulated states! However, even within regulated markets, municipalities and electric cooperatives can decide to procure electricity independently of the electric utility monopolies.

Regardless of how one decides to source and manage their energy consumption, a paradigm shift has occurred in the electric power industry. A major transformation is sweeping across the planet, and we now can act as foot soldiers of the renewable, microgrid future. Individuals, businesses, and communities are no longer purely reliant on the economies of scale afforded by electric utility monopolies. Recent solar PV installations are indicative of the distributed nature of solar adoption. In 2022, utility-scale projects only accounted for about half of the total capacity of global solar PV installations, while roughly a quarter of the capacity came from commercial and industrial projects and the remaining quarter from residential systems.[155]

Solar PV technology levels the electricity generation playing field, providing a unique opportunity for everyone, not just large electric utility companies. Electric utility companies are worried about the threat this poses to future revenues, and for this reason there are policy wars taking place in many jurisdictions within the United States and elsewhere to inhibit residential and commercial solar PV adoption. The threat of solar PV to electric utility companies is only made greater by the ever-increasing affordability and capability of energy storage systems. When paired with solar, energy storage systems, such as battery storage, enable homes and businesses to circumvent adverse policies and become even more self-reliant.

Going solar is a no-brainer in most areas of the U.S. because the avoided electricity costs more than offset the initial investment within the first 9 years or sooner. This is true unless your electric utility has established predatory solar compensation schemes or even disallowed net-metering altogether. Installed residential and commercial solar systems that are not paired with storage rely on "net-metering" to ensure the benefits of cheaper energy are passed through to the owner of the solar array. Given the low cost of solar PV systems, the electricity they produce is substantially cheaper than what your utility charges you for electricity. When a solar system (one that isn't paired with storage) produces more electricity than can be consumed by the home it is installed on, the excess energy is delivered to the grid, and the owner of the small-scale solar system is typically

credited for their excess solar generation on a one-to-one kWh basis, effectively enabling the utility customer to receive full retail-rate compensation for the renewable energy they provide to the utility company.

Unfortunately, many state regulators have surrendered to electric utilities' aggressive efforts to restrain small-scale distributed solar generation by decreasing the amount customers are paid for excess generation, often pushing for a method of remuneration referred to as "instantaneous net-billing." In summary, depending on the exact compensation scheme, instantaneous net-billing can rob the owners of solar arrays by allowing electric utility companies to pay them at an unreasonably low rate in exchange for exported electricity. This drastically increases the payback period for solar investments and inhibits solar adoption. Some states and electric utilities have even rejected applications for any new solar system interconnections and assigned special "fixed charges" only to customers who have solar.

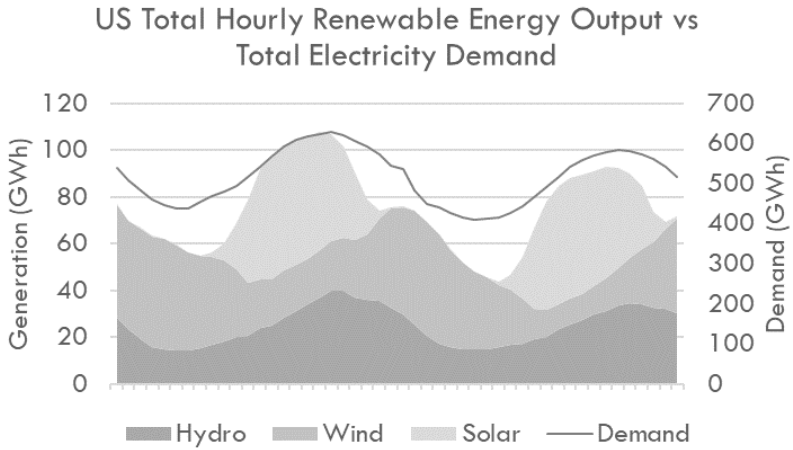
In other words, some companies blatantly target and disincentivize rooftop solar rather than facilitate what is arguably the most practical and inexpensive climate solution available today. This should not come as a surprise. Investor-owned utilities are ruthless, and they want to safeguard future sales while ensuring they are the ones who secure the return from investing in renewables. It's very unfortunate that some state governments have facilitated utilities' attacks on the perceived threat of cheap, distributed renewable energy while placing little pressure on those utilities to hasten their adoption of clean energy. Much like I mentioned earlier in the book regarding the distribution of coal-fired power plants across the U.S., the map of states that have established hostile environments for small-scale solar closely resembles a political map of the U.S. You can guess where it's generally harder to go solar. In this regard, the Republican Party has historically and systemically inhibited families from saving money and becoming more self-reliant, contradicting some of their supposed conservative core values.

Energy Storage & Management

In the U.S., solar energy production is higher during the summer months, peaking during June and during solar noon, when the sunlight is most direct. As a whole, the U.S. produces roughly twice as much solar energy during the month of June than during December.[156] Wind energy production is on a schedule somewhat opposite of solar, which makes the two a great pair. Wind turbines tend to crank out more energy during the winter and at night when wind resources are typically greater in North America. Hydropower is comparatively

steady and can serve as a base load power source, but its peak output can depend on a variety of factors including rainfall, downstream agricultural demand, snowmelt, and wholesale electricity prices.

The following chart shows the total hourly output of hydro, wind, and solar resources across the U.S., compared to total national electricity demand, during a randomly-selected, two-day period in September 2023.[157]



As you can see in the chart above, the total combined output of renewables in the U.S. is variable but aligns quite well with demand. Looking forward, as renewables continue to displace fossil fuel resources on the grid, whenever there is a surplus or a shortfall in the supply of renewable energy, energy storage systems will redistribute that energy to align overall supply and demand.

There are several types of energy storage technologies available today besides battery storage, including pumped hydro storage, hydrogen, and thermal and gravity storage systems. The most widely deployed of these is battery energy storage, but hydrogen and fuel cell technologies are a promising, emerging solution that has the potential to store vast quantities of clean energy for long durations, even from season to season. Hydrogen contains more energy per unit mass than any other fuel.[158] Excess renewable energy can be used to power electrolyzers, which use electricity to split water into hydrogen and oxygen. The hydrogen fuel that is produced can be saved for later use in a fuel cell to produce electricity. Hydrogen produced and used in this manner is a fully decarbonized fuel and is referred to as green hydrogen. The infrastructure to support the green hydrogen industry is already being developed and deployed, and hydrogen fuel cell technology is in use today across various vehicular and backup power applications.

Like solar, hydrogen and battery storage are highly modular technologies that can be implemented at large and small scales for a variety of needs ranging from utility-scale power generation to personal transportation. As companies and households continue to adopt hydrogen and battery storage, these resources will play a greater role in meeting our energy needs. For example, not only can our vehicles function as our way of getting around but they can be connected to our homes to provide backup power and store excess solar energy. Rather than considering energy consumption at home and on the road as two completely separate matters, they are now thought of as interconnected, interdependent, and more reliant on energy management software and systems. This is one way in which our energy consumption is becoming more dynamic and complex. This complexity is often associated with lower reliability, but that isn't the case when considering *self-reliance* as a priority. However, becoming more self-reliant requires increased energy consciousness, adaptiveness, and flexibility.

There is a conservative narrative that solar and wind energy are too unreliable to power society and their variable electricity production cannot meet our needs. It is true that the variable nature of renewable energy poses a challenge to grid operators. As more and more renewable power plants are built, we have to make significant changes to our electric transmission and distribution systems, but these issues are not unfamiliar and do not extend beyond our technical capabilities. Historically, fossil generators have been dispatched to prescriptively meet the variable electricity demand of the masses. Today, the matter is more complex. Now, we must use a combination of variable electricity production and dispatchable electricity production to counterbalance variable demand and dispatchable demand, where we dispatch some of our production from energy storage systems and other generators and dispatch some of our demand by charging energy storage systems and by scheduling our electricity consumption for times when electricity is most available. I'll refer to the concept of shifting our demand as load shifting.

In the electric utility industry, load shifting refers to altering electricity consumption to shift usage typically occurring within a certain window of time into an earlier or later time. Load shifting and demand response are highly valued by electric utilities because it enables them to minimize seasonal demand spikes and avoid having to build additional power plants. Electric utilities will often pay eligible large-scale industrial customers to be available to reduce or temporarily stop their consumption during 'peaking' events when the grid is experiencing high demand or nearing its capacity. These customers are offered various incentives to be flexible with or available to curtail their electricity demand.

Demand response is valued by utilities because there may be just a few days each year when demand for electricity is high enough that utilities might not be able to dispatch enough 'peaking' generators to meet electricity needs. The incremental investment for peaking generators is costly and wasteful when considering the few hours the plants are operated throughout the year. If utilities can avoid these high-demand periods, they save tens or hundreds of millions in avoided capital expenditures.

Load shifting to reduce emissions requires altering electricity consumption so hourly demand is better aligned with the hours of the day when renewable energy resources are cranking out the most electricity. With load shifting, all customers, not just large-scale customers of electric utilities, can make deliberate changes to their daily consumption habits to facilitate the continued integration of renewables while still using the same overall amount of electricity. Homes and businesses that have installed solar can control their supply and demand by changing their habits, altering their schedules, and using battery storage and energy management systems to capture and use clean energy. There are even systems that are entirely "off-grid" that can sustain themselves independently.

By shifting demand, we can better align our electricity consumption with the sun and the wind. For example, if you have solar panels installed on your home, you can align your electricity consumption with solar noon. You can do this by waiting until the brightest hours to cool your home in advance of the afternoon heat, plug in your electric vehicle, do laundry, cook, use tools, charge devices, etc., and then deliberately shut things off and conserve energy when the sun isn't shining. If you are located further south or southwest, you can shift your load to the brightest hours of the day and try to conserve energy by curbing your consumption at night and during periods of overcast weather. If you live in the Great Plains, you can shift your consumption to windier times. The renewable energy resources that surround us can guide our individual consumption habits to an extent, but you are unlikely to significantly reduce your emissions by load shifting alone. The complexity of incessantly monitoring environmental conditions and electricity demand makes the matter impractical and overwhelmingly tedious. For convenience and practicality, utility-scale energy storage and management comes into play. Society's capability of synchronizing our consumption to times when renewable energy is naturally available is increasing. With established and emerging energy storage, grid monitoring, and advanced metering technologies, we can better capture renewable energy and save it for later.

Anyone who doesn't believe in the potential of renewable energy,

distributed generation resources, and microgrids hasn't considered what their smartphone is doing—storing energy and powering an extremely complex, sophisticated, off-grid system. In many ways, what is occurring today in the electric utility sector is what has already occurred in the telecommunications sector. A centralized, antiquated industry is being upended by the more sophisticated, tech-enabled, distributed world of clean energy. Society has already chosen the smartphone; similarly, the scales have tipped in favor of smartenergy, with all its desirable features. Individuals and communities can finally detach themselves from eroding, coal- and gas-dependent monopolies and choose energy independence. *Theoretically*, the role of major electric utility companies could one day be reduced to providing only backup power.

By becoming a more energy-flexible civilization and synchronizing our demand with periods of high levels of generation from renewables, we can better facilitate and accelerate the journey to carbon neutrality in the electric utility sector. Who knows, in the not-to-distant future we may be using apps on our cellphones to integrate and schedule our home electricity demand, vehicle and equipment charging, and battery discharging to align with and maximize our usage of our distributed renewable generation resources and shared microgrid capabilities.

The reality is, paired with energy storage technologies and advanced metering and distribution infrastructure, our ability to meet our electricity needs with renewable energy is virtually unlimited given society's rapidly advancing technological capabilities. It is *currently* not feasible for us to meet *all* of our electricity needs with renewables, but (aside from the storage deficiency) this is largely because the internet of things is still expanding at a breakneck pace and many load balancing and retail metering systems depend on brittle, obsolete, analog equipment.

Speaking generally, there are many things currently holding back our full transition to a zero-emission electricity sector. Among these hurdles are our expectation to have as much energy as we want whenever we want it, our inability to control when renewables are available, and our currently inadequate capacity to save the renewable electricity produced for later use. There are a variety of limiting conditions, unique from region-to-region, which directly affect the aggregate output of renewable energy resources and the carbon intensity of the grid. These conditions come in the form of both physical and political limitations. Another hurdle, as we saw in the chapter discussing the energy sector in Missouri, is recalcitrant, corruptive monopolies creating regional renewable energy deployment deserts. Renewables are not being deployed evenly across the U.S., as

there are significant sociopolitical, regulatory, and market differences from state to state. Theoretically, you could relocate from areas of the Midwest or Southeast to areas that have installed greater amounts of renewables, such as California, the Northwest, or the Northeast, and halve the emissions associated with your electricity consumption while still consuming the same overall amount of electricity. However, no one is expected to relocate themselves to reduce their emissions.

The right climate solutions depend on the unique market characteristics and resources available in your location. As energy storage, electrification, automation, and grid modernization rapidly advance, renewable energy systems will continue to take over the market and our grid will become less centralized. It will become more distributed and will be composed of 'microgrids.' Rather than rely on a few enormous power plants, cities will receive electricity from thousands or even millions of power sources. This will mark an unmeasurable increase in resilience, security, and self-reliance.

Energy Self-Reliance & Security

As it stands today, lots of our electricity in the U.S. is derived from just two coal mines in Wyoming. Lots of our fuel deliveries are reliant on just a few major pipelines. What if something were to happen to just a few of these systems? Whether a natural disaster, a military strike, a ransomware attack, or some other operation targeting our infrastructure, today's society is utterly vulnerable because we are overly reliant on a few large systems operated by supply chain monopolies profiting from our energy needs. Renewables offer us independence from the energy monopolies and oligopolies and safety against potentially devastating attacks or events.

Renewables and energy storage are freedom from energy insecurity and the stranglehold of reliance on utility and energy monopolies that may or may not share your urgency in mitigating climate change. Many Americans tool around, flaunting their freedom while simultaneously driving hyper-inefficient trucks and using electricity from coal-fired power plants—activities that are vulnerably dependent on the steady flow of gas and coal. If something were to happen to that fossil stream, one could quickly be without power or transportation. It really is terrifying to consider how quickly a vehicle can become useless. Your truck is only as reliable as the supply of gasoline, and a single tank of gas can only get you so far.

There are numerous past examples of fuel supply shortages and Americans' panicked reactions. The energy crisis in the 1970s was the result of

the Organization of Arab Petroleum Exporting Countries reducing petroleum production and proclaiming an embargo on oil shipments to the United States beginning in 1973. Oil prices sky-rocketed, fuel shortages caused gas stations to close and lines at the pump to grow across the country, energy efficiency and conservation became a hot topic, and the U.S. created the Department of Energy and invested in developing alternative sources of power such as solar and wind energy. American auto manufacturers also suffered. Americans realized the big, inefficient vehicles they were driving weren't nearly as wise of an investment as the smaller, more efficient Japanese models. Thus, Toyotas and Hondas began to take over the roads.

Surprisingly, Americans have forgotten the lessons learned in the '70s and reverted to buying uneconomical pickup trucks and SUVs. Furthermore, many of these consumers do not live lifestyles that require a truck in the first place, with speedbumps being the most challenging terrain they encounter. Many owners of trucks and SUVs purchase those vehicles knowing they are only likely to truly need them when they go on weekend trips or vacations where they are more likely to encounter rough terrain. The average truck owner in the U.S. only tows something once or twice a year.[159] If you are an adventure seeker without the day-to-day need for a truck, buying a small, efficient vehicle and then renting a truck or SUV is most cost effective for your occasional road trips and excursions. If everyone had this mindset, the market share of large vehicles on the road would be dramatically reduced, and our national average vehicle fuel economy would be much higher.

A more recent example of the vulnerability of our fuel supply is the 2021 ransomware attack on the Colonial Pipeline, which stretches over 5,000 miles from Texas to New York. The disruption caused fuel prices to surge to a degree typically only seen when hurricanes interrupt refinery and pipeline operations in the Gulf. The fuel shortages were compounded by panic buying in the Southeast, leaving thousands of gas stations without fuel. At one point, most of the gas stations in North Carolina were out of gas.[160] Whether digital or physical, threats to our energy security should not be taken lightly, and remaining overly dependent on fossil fuels is a long-term risk we shouldn't take.

Renewable energy and electric vehicles, on the contrary, can guarantee a level of energy and transportation security that is independent of regional supply chains. When you buy solar, you are essentially buying 30 years' worth of fuel, which is something that was simply not possible before renewable energy came to be. If some force majeure event were to cut off the supply of gas and coal in your region, you'd at least have some, if not an unchanged, amount of energy and

transport capability with an at-home solar-storage-EV system. Depending on your chosen system and capacity, you might not have all the power you want, but you could get by. One could even make the full investment to have complete energy and transport independence and off-grid capability, today. Component prices are declining, and off-grid-capable homes are popping up left and right. Do we really want to take charge of our freedom and express our independence? Rather than buy a $60,000 new gas-guzzling truck, households can have a base model electric vehicle, a home solar module array, and battery storage. It is the choice of the consumer. Do they want a gas pickup truck? Or do they want electrical independence, fuel independence, and off-grid capability?

Electric vehicles are, of course, another major pillar of the energy transition. The concept of an electric vehicle has been around for nearly 200 years. Prior to the expansion of America's road network enabling the public to drive long distances, short-range electric vehicles outsold gasoline vehicles. Recently, growing electric car sales have been hampered by prices (which are declining) and range anxiety, but new models offer ranges from 200–400 miles—enough to meet the average American's travel requirements for a couple weeks. Plus, owners of electric vehicles can enjoy avoiding the pump by charging at home. Although many electric vehicle models come at a price premium relative to typical internal combustion automobiles, the savings from reduced fuel and maintenance expenses (since electricity is much cheaper than gas and electric vehicles don't require regular oil changes and other kinds of maintenance common for gasoline vehicles) can offset the additional cost. And this is assuming the cost of gasoline won't ever skyrocket—a risky assumption considering significant potential force majeure changes.

When this sentence was written in early 2022, gasoline prices were 50% higher than a year prior. We've become numb to sporadic fuel price fluctuations, but we can avoid this chaos with electric vehicles and renewable electricity, which offer fuel price certainty. Furthermore, as society shifts away from fossil fuel consumption, it will have broader economic benefits by reducing inflation. Renewables are intrinsically deflationary, whereas fossil fuels are intrinsically inflationary. With wind and solar investments, virtually all capital expenditures are known upfront. Electricity prices are more stable and predictable than gasoline prices, and this will become even more important as the grid continues to be decarbonized. Fossil fuel prices, on the other hand, are guaranteed to increase with time because of the nature of the industry. Governed by geology, fossil fuel extraction begins by exploiting the most economical reserves first, with extraction becoming more difficult and costly as reserves are depleted. Other events that

may cause increases in gasoline prices include crude oil supply disruptions, significant growth in demand in China and other nations, and potential regulations, such as a carbon tax.

As the transport sector electrifies, demand for electricity will rise. This may challenge our ability to meet our energy needs with variable renewable energy, but electric vehicles can be a part of that solution by providing a large network of batteries that can be used to store excess renewable energy production. Electric vehicle charging networks and at-home systems will provide electricity storage services for the modern, automated, interconnected, renewable grid.

Change is coming swiftly. Manufacturers of pickup trucks and SUVs have already announced plans to transition to 100% electric. California has banned the sale of new gas-powered cars beginning in 2035. The Inflation Reduction Act has supercharged the transition to a renewable electricity sector. Society is pivoting away from fossil fuels today. We are capable of giving clean energy a much-needed push forward. Place your demand on the products you want to succeed. Together we can accelerate the technological revolution occurring in global energy and transport markets.

Wave and tidal, geothermal, hydro, hydrogen, nuclear, carbon capture, and biomass energy resources will all play important roles alongside wind, solar, and storage in transitioning our planet to carbon neutrality. Geothermal energy has great potential, especially when considering its suitability to meet heating and cooling needs in the residential and commercial sectors. Geothermal heat pumps, also called ground-source heat pumps, are used to regulate the temperature of buildings using constant underground temperatures, resulting in significant energy savings that offset the additional costs of installation (relative to conventional heating and cooling systems) in 5 to 10 years.

The energy realm is so vast. No one individual technology will be the solution to global warming. Our planetary energy needs will be met with an entire spectrum of solutions tailored for various utility-scale, industrial, commercial, and residential applications. Perhaps some unforeseen advancement or discovery may present itself to us in the coming decades, making humanity's most monumental challenge much easier than expected. That would certainly be welcome.

Food and Forests

This section combines food and forests because our diet, and the agricultural system that supports it, is the greatest threat to the remaining wilderness on our planet. Minute by minute, we are devouring vast swathes of

healthy, ancient, biodiverse, carbon-rich ecosystems, replacing them with pastures and monoculture production systems. By reducing food waste, reducing meat consumption, and altering standard agricultural practices, we can help reduce emissions and deforestation rates, and restore wild habitats by changing land use patterns.

We are reducing our global emissions to safeguard the richness and beauty of life on Earth. To fail to protect what remains of Earth's biodiverse ecosystems along our path to carbon neutrality is to completely lose sight of why we are reducing our emissions in the first place. This section highlights a few prominent nature-oriented solutions that are potent weapons in our arsenal of tactics for mitigating both ecological destruction and greenhouse gas emissions.

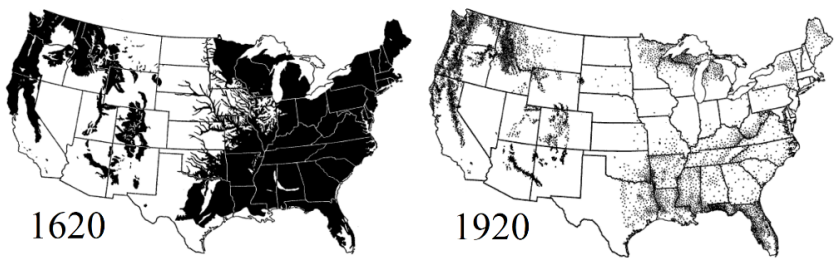
Starting with the lowest hanging fruit, we need to reduce food waste ASAP. Roughly one-quarter of humans work to produce food, and one-quarter of that food goes to waste.[161][162]This waste occurs at both the top and the bottom of the supply chain and in both rich and poor countries. In the United States alone, willful food waste could feed tens of millions of people. This willful waste is exacerbated by unstandardized expiration labeling requirements and a general lack of regulation targeting food waste. However, willful waste is caused primarily by other systemic issues. The heart of the issue in America is deeply ingrained in our 21st century culture. Collectively, we Americans have become so divorced from our relationship with the land, and food production, that we have made a habit out of leaving food on our plate, tossing out imperfect food bits, letting food spoil, and throwing away leftovers. We no longer associate these actions with going out in the field and working more hours to grow more food. We no longer think pragmatically in terms of sustaining ourselves. We simply go to the nearest international food market (the local grocery store) to buy more food and create yet even more food waste. Rather than taking these food scraps and putting them to good use, whether through composting, animal feed, or other resourceful activities, we send them to the landfill. This is happening at the individual level, at restaurants, and at major supermarkets across the U.S. In several places outside of the U.S., it is illegal for supermarkets to throw away unsold food that could be given away.[163] Our food is a precious, expensive, emissions-intense resource. We should be making the most of it and licking our plates clean.

Depending on what we eat and how that food is produced, our diets can drive ecological destruction by indirectly causing widespread pollution and land degradation. The shift from smallholder farms to industrial agriculture has been accompanied by adverse dietary changes and the establishment of a production

system that views nature as something to be exterminated. This has perhaps been taken to the greatest extreme in the Midwestern and Mississippi River Basin regions of the United States, where agricultural production is dominated by industrial systems that rely on heavy machinery and synthetic pesticides and fertilizers.[164][165]

These systems of production depend on enormous, GPS-guided machines tilling up the earth and spewing synthetic chemicals to produce commodities of little use other than feed for livestock and constituents in unhealthy processed foods. The nutritional value we are getting out of these systems is way below what alternative, sustainable agricultural practices could yield, and we are literally feeding ourselves harmful chemicals. Additionally, synthetic nitrogen fertilizers, such as urea and anhydrous ammonia, are applied generously to soils across the U.S., causing enhanced emissions of nitrous oxide (N2O), an extremely potent greenhouse gas, from microbial processes in soils. This source of nitrous oxide is the chief greenhouse gas emitted in the agricultural sector in the U.S., even ahead of methane emissions from enteric fermentation in cattle.[3] However, since roughly 40% of all corn and over 60% of all soybeans produced in the United States are used for animal feed, it is fair to attribute much of the nitrous oxide emissions in the U.S. to beef production.[166]

The United States is the Earth's premier example of mankind's willingness to raze and continuously neglect entire landscapes, systematically, with no regard for the impact on ecosystems, humans, and the Earth. We eliminated most of the forests and prairies in the contiguous United States, and today those lands are occupied by modern monoculture systems producing cash crops at scale. When weighing in on international discussions regarding climate change and the preservation of natural environments, we cannot forget our nation was built by digging up the earth, burning billions of tons of fossil fuels, and deforesting 90% of our continental land mass. The U.S. virgin forest maps below depict America's impact on our forests over 300 years.[167]



As you can see, by 1920 most virgin forests in the U.S. had been eliminated. Since 1920, a lot of our forests have recovered, to an extent, but the

overall impact of forest disturbance is permanent. As virgin forests are destroyed or degraded due to human activity, we are losing ancient ecosystems that evolved over the course of hundreds of thousands to millions of years—ecosystems that have accumulated vast biodiversity and extraordinarily complex species interactions, most of which remain unknown to humans. That is something that can never be fully restored.

Current deforestation rates in the Amazon are comparable to past deforestation rates in the eastern U.S. The millions of acres of degraded land in the Mississippi River Basin, also referred to as the "Amazon of North America," serve as a stark example of the potential future of South America's rainforests. The destruction we are witnessing in South America is fueled by commodity agriculture, primarily beef and soy, which (along with other monoculture production systems and pine plantations) have transformed the landscape of North America. The current rates of deforestation occurring in the Amazon, Congo, Southeast Asian forests, and other regions are not necessary to provide the food and resources for modern society to continue to advance and develop, but rapid deforestation and conversion of other natural landscapes will continue in the absence of dietary shifts, grassroots programs and policies, broader government regulations and initiatives, and international financial support to safeguard our remaining critical global terrestrial carbon sinks.

Reducing your meat intake, particularly beef, is one of the best things you can do to drastically reduce your carbon footprint. If cattle were their own country, they would fall only behind the U.S. and China in terms of greenhouse gas emissions.[168][169] But the cattle aren't the ones to blame; it's who's eating them. Much of the emissions associated with beef production are in the form of methane from enteric fermentation. However, a great deal of emissions stem from land conversion, deforestation, and poor management decisions being made by the highly exploitative cattle industry. Additionally, significant supply chain emissions are embedded in the agricultural commodities used to feed and fatten cattle. The emissions associated with the production of those crops are embedded, or accounted for, in the meat and dairy products that eventually get sold to consumers.

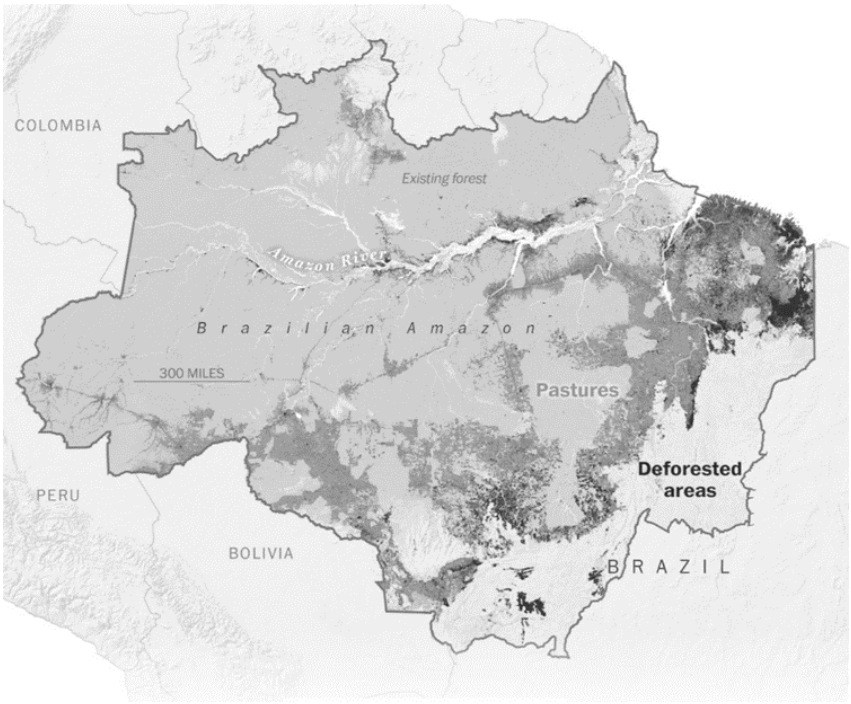
When we avoid meat and dairy products, we avoid all the resources and environmental degradation necessary to produce them. Our meat-heavy diets demand more resources, land space, and energy than necessary to live strong and healthfully. If, hypothetically, all U.S. citizens were to start treating meat as a rare delicacy and substitute beef consumption with plant-based foods (which are more resource-efficient sources of protein) an area roughly the size of Texas could be

converted from corn and soy production into forest, grassland, or other natural ecosystems to better serve our planet.[170]

Unfortunately, global beef demand is continuing to grow, and accompanying that growth are even more emissions and further environmental damage. Although constituting only 4% of our global population, America accounts for more than 20% of global beef consumption and is highly responsible for the damage done by the beef industry.[171] This damage includes and extends beyond greenhouse gas emissions, land and water contamination, and land conversion and deforestation. Globally, the single largest driver of deforestation is cattle ranching in the Brazilian Amazon, having caused roughly 80% of the more than 780,000 square kilometers of forest loss in Brazil over the past 30 years.[172][173] Over the course of just one generation, the Brazilian cattle ranching industry has deforested an area the size of Texas, but it's not just Brazilian appetites that are fueling the demise of the Amazon.

The global frontrunner in beef production and the largest beef processer in Brazil is the Brazilian company JBS S.A. Not only is the company the king of Brazilian beef, but it is the world's largest meat processing enterprise. JBS has a deep international presence, having acquired several major beef and meat processing companies in the United States and other countries. Of JBS' reported net revenue of U.S.$18.1 billion during the second quarter of 2023 alone, $11.9 billion, or 66% came from JBS' U.S.-based operations JBS Beef North America, JBS U.S.A Pork, and Pilgrim's Pride.[174] Although JBS is technically a Brazilian company, its operations and revenue depend largely on American dinner tables. Brazil is the world's largest exporter of beef, and as of 2022, the United States is the second-largest import market for Brazilian beef.[175] America has blood on its hands.

The following map of deforestation in the Brazilian Amazon is from a 2022 article titled *The Amazon, Undone: Devouring The Rainforest*, by Terrence McCoy and Júlia Ledur of The Washington Post.[176]



The map above shows where the forest has been converted to pasture, as well as other deforested areas, which consist primarily of monoculture soy production and subsistence farming. As you can see, the vast majority of forest loss is caused by cattle ranchers converting the forest to pasture to support beef production.

The Amazon is the greatest untamed wilderness. It supports an incomparable level of biological and cultural diversity, sustaining millions of species as well as nearly 3 million indigenous people comprising hundreds of distinct ethnic groups.[177] The map above depicts a heartbreaking story of retreat over the past few decades. The situation is akin to the ruthless extermination of Native Americans and wildlife throughout the westward expansion of the United States. Cattle ranchers in Brazil have massacred indigenous peoples, used slave labor, illegally claimed land, and are to this day illegally deforesting the land. The main driver behind all of this is the shady cattle laundering industry, which ultimately enables illegally produced beef to eventually be sold not just to companies like JBS in Brazil, but also through JBS to major retail chains in the United States, such as Kroger, Safeway, and others.[176]

If you want to help curb the atrocities occurring in the Amazon, help reduce methane, nitrous oxide, and carbon dioxide emissions, help reduce the widespread use of toxic agrichemicals, reduce your risk of cardiovascular disease, cancer, and diabetes, and help advance efforts to conserve land and feed our

growing global population, then don't eat beef. It is truly amazing how horrible this stuff is. There is no need to eat a pound of it each week like the average American does. Beef should not be a staple food. It should instead be treated as a rare delicacy. This alone is a major climate and environmental solution.

Beef and other red meats have a higher emissions intensity per calorie than virtually all other foods and should be excluded from an Earth-friendly diet. Related to red meat production, butter, cheese, and dairy production are energy intense industries that provide an economic crutch for the meat industry. Just as consumption of plastics, synthetic tires, detergents, and other petrochemical-derived products supports the profitability of big oil, dairy consumption improves the outlook for the cattle production industry. If you consume a derivative of a resource, you make the primary resource more profitable. We can transition to low-meat, low-dairy, low-cash crop diets to bolster our progress on climate change and reduce deforestation and land degradation. This transition requires consumers to become more aware of the impacts of our diets and advertently avoid consumption of red meat, soy, corn, and other agricultural commodities associated with undue environmental degradation. For this transition to occur as universally as is necessary to sustainably feed the 8 billion people alive today, and billions more in the future, there need to be other succulent options to divert our pallets away from the porterhouse and the patty. Plant-based and fungi-based alternatives are beginning to hit supermarket shelves and are increasing in popularity as consumers realize the health benefits.

Believe it or not, until the late 1960s organisms were classified as either plants or animals.[178] Fungi were classified as plants despite the now obvious photosynthetic difference between the two kingdoms. We now know fungi and plants are quite different—fungi are more similar to animals than they are to plants. Mushrooms are, culinarily speaking, a bit of a cross between meat and plants, with a nutritional profile of a low-grade meat and a high-grade vegetable. There are more than a million species of fungi, most undiscovered, and each is remarkable in its own way. Most individuals in the western world include only plants and animals in their staple diets, excluding our fungal friends. However, mushrooms contain unique nutrients that aren't found in other foods, as well as nutrients that are in both meat and vegetables, so if you truly want to balance your food intake, you should pay more attention to the underappreciated fungi!

Edible mushrooms contain substantial amounts of B vitamins, copper, protein, potassium, choline, vitamin D, selenium, fiber, phosphorous, niacin, folate, and amino acids, among other important nutrients. Some mushrooms even contain as much protein as meat. The true magic of mushrooms lies in the

fact that mushrooms do more for you than simply provide nutrition and sustenance. Many species of mushrooms also have anti-cancer, neurogenetic, immunomodulatory, antioxidant, and other benefits. That certainly sounds more appealing than a bloody, bacteria-ridden piece of animal that increases your risk of cardiovascular disease, cancer, diabetes, and premature death.[179] Considering the hundreds of thousands of discovered and undiscovered species of fungi, combined with human intervention and cultivation, perhaps the future unknown will bring to us a delicious, meaty, healthy, fungal alternative to flesh that packs the protein and amino acids but also includes the many other unique health benefits of mushrooms. Don't think this is possible? Go check out chicken mushrooms, also known as chicken of the woods. They are a meaty, fibrous species of mushroom that can be used as a substitute for chicken and, when prepared imaginatively in tacos, pasta, or BBQ, can be consumed by unsuspecting individuals who are unable to differentiate the mushroom from the bird.

Certain plant-based alternatives to meat are even more convincing than fungi-based options and can better or nearly perfectly replicate the nutrient content of meat while omitting the unhealthy components. You've likely heard of the Impossible Burger or Beyond Meat or seen the plant-based brats and 'chicken' nuggets, but what is on the horizon of this promising new industry? With a year-over-year compound annual growth rate in the double digits, the multibillion-dollar plant-based meat market is expected to double quickly and keep growing for decades as people seek out ways to make their diets healthier and better for the planet.

The scale and pace with which our food systems are destroying our natural, carbon-rich ecosystems is frightening. The most impactful and immediate thing you can do to curb deforestation and land degradation is reduce or eliminate your meat consumption (emphasis on beef) and consumption of products containing derivatives of cash crops produced using unsustainable practices. Eating less beef and less of a few other types of food will benefit your body, our soil, global ecosystems, and will improve the livelihoods of millions of people by reducing payments to streamlined operations and redirecting money to smallholder farms, which currently employ most of the world's farmers and provide roughly one-third of global food production using just 12% of the world's agricultural land.[180][181]

Transformations are occurring. Combined, shifting dietary preferences, a growing awareness of the financial and environmental benefits of regenerative agriculture, silvopasture, and agroforestry, and improvements in waste and nutrient management have the potential to drastically shrink the agricultural

component of our global footprint. And if science and industry are able to work with nature to develop even better, hyper nutritional, hyper flavorful, protein-packed, meat-mimicking substitutes for actual meat soon, our outlook could be much brighter.

The connection between diet and land degradation needs to become common knowledge. The general public needs to become more aware of conventional agriculture's devastating impact on our planet. If we are to feed a growing population set to peak around 11 billion at the end of the century, the only way to avoid continued mass starvation, malnourishment, and ecosystem destruction is by reducing both global meat consumption and the production of certain cash crops.[182] By transforming food production systems and altering our diets, we can improve the living conditions of billions while helping restore our forests and other degraded landscapes.

Our forests and their possible expansion are undoubtedly an invaluable tool in the climate battle. The ability of forests to store carbon is dependent on their ability to form symbiotic relationships with fungi, which form vast underground networks of mycelium. Mycelium are comprised of microscopic 'threads' called hyphae that encapsulate and bore into tree roots, drastically increasing the surface area of trees' root systems and their ability to absorb water and nutrients from the soil. Through photosynthesis, trees provide sugars to the underground fungal network in exchange for vital minerals transported through the mycelium. Over 90% of plant species depend on mycorrhizal fungi, whereby mycorrhizae solubilize minerals from the soil in exchange for plant sugars produced by photosynthesis.[183] This interconnectedness enables trees in forests to communicate and share nutrients with one another, providing a balancing and defense system that makes the entire ecosystem more productive and resilient. This highly complex and barely understood underground communication and trade network extends beyond trees, benefiting virtually all plants in forest ecosystems and other ecosystems. This network even gives rise to non-photosynthetic plants such as Indian Pipe, Beechdrops, and several species of orchids. Certain species of orchids have been found that spend their entire life cycles underground, relying exclusively on energy and nutrients delivered to them through the underground fungal network.

When you see a healthy forest, what you are seeing is only possible because of what is happening beneath the surface. Roughly 75% of terrestrial carbon is stored belowground.[184] Most of this carbon enters the soil through the vast underground fungal mycelium network which supports the functioning of forests and other ecosystems. Mycology, the study of fungi, is a nascent field

with an expanding community of amateurs and scientists alike. Some mycologists are seeking to leverage the power of fungi to expedite the restoration of our forests and other landscapes and sequester more carbon.

As was shown earlier, the U.S. deforested 90% of its continental land mass during our development. What is inspiring, is since the first half of the 20th century much of the temperate forest that was lost in the U.S. has returned, revealing the resilience of these complex ecosystems and their ability to restore themselves. However, we are only beginning to understand the complex interconnectedness of plants, fungi, and animals in forests. At best, we can facilitate or supplement forest recovery but not recreate the entire ecosystem from the ground up. That is a pipe dream, so further deforestation should be avoided at all cost, particularly in tropical regions. The combined effects of climate change and the continued conversion of the Amazon to pasture could result in widespread diebacks caused by drier conditions. The entire Amazon biome is at risk of collapse. Today, tropical forests along the equator are under assault and disappearing quickly. Their extensive clearing and degradation are largely being driven by outside demands for beef and cash crops. The sooner we create a consumer environment that incentivizes forest restoration, rather than destruction, the sooner our global forests will be able to begin recovering and naturally achieve a net drawdown of carbon from the atmosphere.

What this requires is international intervention from industrialized nations with the intent of placing a value on tropical forests and compensating nations for averting their destruction and supporting their conservation. There are a variety of economic, social, and policy approaches to curbing deforestation, reforesting degraded land, and ensuring continued preservation of these invaluable ecosystems. Communities in tropical regions need to be compensated for maintaining these carbon sinks, which are resources of global value. Solutions may venture beyond agricultural, timber, and carbon markets. For example, the pharmaceutical industry (but more importantly humans) stands to benefit from the preservation of tropical ecosystems which are home to tens of thousands of undiscovered fungi and plant species of potential medicinal value.

It is difficult to grasp the carbon capturing potential of forests. It has been estimated that, globally, an area roughly the size of South America is suitable for forest restoration.[185] Imagine the sheer mass of carbon that could be sequestered in woody biomass and soil if such a large area of land were to be restored as healthy forest. Carbon markets have acknowledged this potential and are compensating various projects all over the world for their successful sequestration of carbon. But can this make a difference in the context of society

and our total global emissions? In short, yes, but only if implemented on enormous scales.

Let's perform a thought exercise. Let's estimate the number of trees you would need to plant to offset one year of your personal emissions, that is, roughly 16 MT (for the average American). According to the U.S. Environmental Protection Agency Greenhouse Gases Equivalencies Calculator, after accounting for 'survival factors' (the probability of a tree living to a certain age), the proportion of coniferous versus deciduous trees (which have different carbon sequestration rates), and typical urban/suburban growing conditions (spacing and shading of trees), the carbon sequestered by one tree allowed to grow for 10 years is 36.4 lbs.[186] This translates to roughly 0.006 MT of CO2 sequestered per year by each tree. That means, to offset your 16 MT of annual CO2 emissions, you would need to plant over 2,600 trees. And this all assumes there will be no emissions associated with the nursery raising the trees, traveling to buy the trees, finding a location to plant the trees, planting the trees, and returning home. The U.S. Environmental Protection Agency Greenhouse Gases Equivalencies Calculator also estimates that over the course of a year one acre of average U.S. forest sequesters 0.84 MT of CO2. This means offsetting the average American's annual 16 MT of CO2 would require preserving a 19-acre area of healthy forest —an area several times larger than the 100 by 100-meter area of inhabitable land available per human mentioned earlier in the book. Hopefully, this gives you yet a further understanding of the scale of your emissions, and why planting trees did not make the list of the 30 actions in this book. We need to allow nature to do its work on a grand scale. You as an individual are unlikely to be able to plant trees efficiently enough to completely offset your footprint, but there are certain organizations and initiatives that make this possible.

Organizations leading reforestation efforts say they are able to plant trees for about $1 a piece. So, theoretically, the minimum price of offsetting your annual emissions by planting trees is a few grand. If you adopt all 30 of the actions in this book, you can reduce that amount by 40%. Charitable gifts made to most nonprofit organizations officially recognized by the Internal Revenue Service (IRS) as having 501(c) (3) status are considered tax deductible contributions. Account for that benefit and your cost for offsetting your emissions drops further.

One example of a noteworthy forest restoration effort is The Nature Conservancy's Plant a Billion Trees campaign, which aims to plant a billion trees across the planet. The Nature Conservancy recognizes the many benefits trees provide besides helping curb climate change, including filtering air, providing

fresh drinking water, mitigating flooding and erosion, and creating homes for thousands of species of plants and animals. Planting a billion trees can begin to help save the Earth from deforestation. One billion is a big number; however, a billion trees will only offset the emissions of a few hundred thousand Americans, a fraction of a fraction of a percent of our global population.

Regardless of the scale of impact, individuals can and should help fund and contribute to the efforts of organizations such as The Nature Conservancy. If you are a passionate climate warrior with some disposable income, this is just one way you can reduce your personal emissions that remain after integrating the 30 actions from this book into your life. Theoretically, by paying a little over a grand to plant trees it is *possible* you could become net-zero for a year, a feat few Americans can claim. However, this solution is not affordable for many, and is not the most efficient option available. It is best to leverage the powers of nature and let nature do the planting, but it is sometimes necessary to plant trees to reestablish a healthy, functioning forest on land that has been significantly altered by human activity or wildfires.

Luckily, there are cheaper forestry- and non-forestry-based solutions that can capture and reduce emissions. For example, forestry carbon offset projects offer more economical alternatives to planting trees by letting established forests recover and by preventing future deforestation. One of the many examples of this approach to offsetting emissions is the story of Shannondale, Missouri.

The Shannondale story highlights a sociopolitical contradiction; despite rural America's great opposition to climate legislation, carbon markets benefit rural America. I encourage you to pass the following story along to individuals opposed to climate legislation and who you feel are part of a community, congregation, or social group that could benefit from learning about opportunities such as the Shannondale carbon offset project. It could help sway the conservative mindset about climate action from being something burdening or foolish, to being something beneficial and necessary.

Missouri landowner Jeff Fulk hadn't heard of carbon offset programs until a forester presented the concept to him during the Great Recession. Through a carbon offset program, forest owners can earn money and protect their land by properly managing forested acreage to offset the emissions of large companies. If you're a landowner with acreage suitable for restoration or reforesting, you may be able to register with a program that will aid you in managing your property to sequester emissions in exchange for a revenue stream as compensation for the climate service your property provides. At first, Jeff Fulk thought this sounded too good to be true.

Carbon offset programs can truly help rural areas flourish. Tucked into the Ozarks of rural Missouri is the tiny community of Shannondale. This remote and peaceful section of hilly countryside is home to an outdoor ministry and a tree farm with an inspiring story of answered prayers. Shortly after the Great Recession in 2008, Shannondale Minister Jeff Fulk agonized over doubts about the livelihood of his beloved historic mission, campgrounds, and tree farm. The economic collapse led to a cease in funding for the Missouri Mid-South Conference of the United Church of Christ. This was the conference Fulk's ministry resided in, and this meant Shannondale was in danger of being sold like other outdoor ministries at the time.

The tree farm's timber sales were barely keeping Shannondale afloat, as the Great Recession threatened their revenue streams. Locals stopped attending church groups within the conference and people weren't using the facility's campground. The income from their timber harvest wasn't quite enough to offset the cost of running their facility, so Fulk considered selling the property.

Fulk prayed for a miracle, and his prayers were ultimately answered by California's Cap-and-Trade Program. A forester with the L-A-D Foundation told Fulk about a project concept that could change the future of Shannondale for the better. Little did Fulk know, he was about to embark on a climate adventure that continued the innovative tradition Shannondale's founder had set forth long ago in 1929.

During an interview with Fulk, he explained Shannondale's history of pioneering. Originally called the Vincent Bucher Memorial Tree Farm, the Shannondale Tree Farm was founded in 1929 by Reverend Vincent Bucher. Bucher and his community were living off the land in the Ozarks of Missouri. After sending preachers out to explore the untouched lands of Shannon County, they purchased a plot of land that looked promising for the growth of oaks and pines.

Bucher's mission was to educate rural Ozarkians about sustainable agriculture so they could preserve their newfound land. He focused on nurturing the land that supported and fed his community, and he made this a reality by leading others to raise livestock, berries, and a tree farm. Not long after establishment in 1929, the Missouri Department of Conservation began managing the land and timber production. The 4,000-acre area was one of the first tree farms in Missouri and is now the oldest remaining tree farm.

Many years later, Jeff Fulk was taking advice from a forester with the L-A-D Foundation to register Bucher's beloved land with a carbon offset program that offered many years of preservation and a generous revenue stream—one that

could mean the difference for Shannondale.

California's Global Warming Solutions Act, passed in 2006, came to Shannondale's rescue. This law gave the California Air Resources Board (CARB) the authority to establish regulations and market mechanisms to implement a comprehensive program to reduce greenhouse gas emissions from significant sources throughout California. The law's goal was to reduce greenhouse gas emissions to the 1990 level by 2020. Today, California's reduction target is 40% below 1990 emissions levels by 2030, and to achieve carbon neutrality by 2045. One of the ways this works is by giving California corporations the option to offset a portion of their carbon emissions by purchasing carbon offset credits from managed forests, registered tree farms, and other entities that absorb CO2 out of the atmosphere or prevent future emissions from entering the atmosphere. This carbon offset program helps carbon emitters meet their emission reduction requirements by funding projects for landowners like Jeff Fulk.

Fulk explained that a forester came by the tree farm to tell him about the carbon credit program opportunity over a cup of coffee. "I hadn't heard of it, but it sparked my interest," Fulk began. "I started looking online to learn about this carbon credit program. This research led to learning about the Chicago Climate Exchange. It sounded great, but within a year they disappeared so this opportunity sat on the burner for a year or two. Later, I heard about the Climate Action Reserve and Finite Carbon. Finite Carbon was really interested in our 4,000 acres."

Shannondale partnered with Finite Carbon, a company that specializes in developing forest carbon offset projects, in 2013. Fulk registered his 4,000 acres of forest with the Climate Action Reserve, an official registry for carbon offset projects linked to California's Cap-and-Trade Program. The Climate Action Reserve decides if certain projects are eligible and how many credits each project will receive. In exchange for registering and changing the way the Shannondale forest was maintained, the Missouri Mid-South Conference of the United Church of Christ received $900,000.

Fulk explained, "When I entered the program, I had no idea what I was doing. I had to trust people and convince others to trust the program, also. And it's paying off! This program protects the land and forest for 199 years."

The registration helps improve forest management for participating entities by maximizing the amount of carbon their forests can capture. For the Shannondale Tree Farm, activities that manage or increase its carbon offset abilities were implemented. Examples include measuring tree species, noting the soil type, noting which direction each slope of the land faces, rotating the harvest

area each year, selectively cutting only the most mature trees, and only cutting the tops of the trees while leaving the stumps.

Fulk proudly stated how successful they were at managing their forests after registering with the Climate Action Reserve. "We managed the forest so well that we could have increased our timber sales and still captured enough carbon to produce more income. But we didn't because we wanted to keep our forests green. The white pine on the south slope rejuvenates the forest on its own. We don't have to replant anything. I'm so proud of our forest and what the carbon credit program did for Shannondale and the community."

Shannondale Tree farm, originally established in 1949, became the first religiously owned entity in the United States to complete a carbon offset project. Since Shannondale's entry into the carbon market, it has been issued over 170,000 offset credits by the California Air Resources Board. This means the preservation of the tree farm has offset over 170,000 metric tons of CO2, which is equal to the annual carbon footprint of roughly 11,000 American citizens. Shannondale continues to offset over 2,000 tons annually.

Fulk expressed, "I truly believe what we are doing with carbon credits aligns with our religious mission. God placed us here to be stewards of the Earth and care for our environment."

Shannondale's agreement was signed for 199 years, committing the tree farm to two centuries of sustainable forestry practices, land protection, and receipt of carbon offset compensation. In addition to the initial $900,000 credited to the Missouri Mid-South Conference of the United Church of Christ, participation in this carbon credit program earns their conference a sum of about $20,000 annually. Shannondale sells its credits roughly every three years. They determine an amount to sell and bank the rest. The Shannondale forest will be here long after we are all gone. Shannondale will thrive well into the future because the forest is protected from commercial logging companies and future developments.

Today, Jeff Fulk's son, Nathan, runs Shannondale. The Fulks have green plans for their ministry and tree farm. Jeff said, "We are more conservation-minded now. I advocate for the carbon credit program and for trying to lessen our carbon footprint. We would love to put in solar panels and are trying to go greener and educate others."

"4,000 acres is a small plot of land in the carbon market, but we wanted to form a group or co-op with other landowners. That was always a dream of mine to have enough people who own property to add up to millions of acres in the carbon credit program together. But it's hard to convince others because they are

skeptical. Missouri could have made a billion dollars, but landowners are afraid of giving up their power. But you're not; you're just cleaning your air!"

"Our forest is like a vacuum sweeper going into a dirty area and cleaning it all up. Then, we sell the usage of what those trees do to a company that buys carbon credits. They are trying to improve their business, reputation, and environment."

The plans and renovation of Shannondale have been made possible by the carbon market. In addition to the generous compensation Shannondale's conference has received from the carbon credit program, their land will be protected and well-managed for entire centuries. Companies buying these carbon credits will do as Jeff Fulk said—improve their business, reputation, and environment. Rural communities are uniquely positioned to make those companies their customers. Rural landowners, if you follow in the green footsteps of Shannondale, you too may feel the benefits of climate solutions and carbon markets. Furthermore, this beautiful planet will thank you for taking care of it.

What happened for Shannondale can be implemented at scale across the Amazon and other tropical regions. This, however, requires a robust international regulatory framework with clear and transparent monitoring and reporting mechanisms, as well as a practical approach to engaging and incentivizing landowners at the grassroots level. Why are we reducing our emissions in the first place? Once again, to safeguard the richness and beauty of life on Earth. Failing to protect what remains of Earth's biodiverse ecosystems along our journey to net zero would be feeble-eyed and heartbreaking. We cannot lose sight of the greater mission, which carbon offset markets and emissions trading systems help us achieve.

Now I want to address the warranted criticism of the industry. Within the carbon offsetting realm there are compliance markets and voluntary markets. Shannondale is part of a compliance market supported by California's government-mandated cap-and-trade system. Compliance offset markets uphold offset projects to rigorous standards that ensure any claimed emission reductions are real and additional. Voluntary carbon markets seek to uphold projects to an equivalent level of integrity and quality, but a lack of standardization and government oversight (like would exist if a national compliance market were established through federal greenhouse gas regulations) has facilitated a patchwork environment of offset registries and standards relied on by companies in the U.S. Thus, there are more likely to be issues around standardization, integrity, and transparency in the voluntary market.

Furthermore, the intrinsic characteristics of voluntary carbon offset markets places an artificially low value, or price, on emissions. The price of an offset is largely dictated by what corporations are willing to pay for *voluntary* emissions reporting and public relations purposes. Most companies aren't willing to pay too much, not nearly as much as the true social cost of their emissions. If the U.S. were to adopt a national carbon tax or cap-and-trade system with an established price for emissions, corporations would be paying a lot more per carbon offset, so long as that price is still lower than emissions allowance prices, the cost of directly reducing emissions, or the cost of penalty payments.

Most companies purchasing offsets in the U.S. are sourcing them from the voluntary marketplace. As with any industry, there are good guys and bad guys and using the renewable energy credit fraud in Missouri as a shining example, the devil is in the details. Fraudulence and greenwashing issues are present in carbon offset markets, but so are meaningful projects with undeniable emissions and environmental benefits. It really comes down to the specifics of a project, who's involved, and who's purchasing the offsets. Although some companies are operating purely with the intent of boosting PR by making questionable emissions claims grounded on purchases of massive quantities of extremely cheap offsets, others are carefully funding wonderful offset projects with tangible and measurable emissions, environmental, and social benefits. Unless the U.S. establishes a national compliance offset market, companies will continue to purchase offsets on a voluntary basis at artificially low prices, and there will inevitably be exaggerated or false claims of carbon neutrality.

Regardless of the controversies, carbon offset markets are relatively new, are rapidly evolving, and the types of offsets available for purchase are changing. Technology-based offsets, for example, include carbon capture and direct air capture technologies that extract CO2 directly from the atmosphere or industrial process streams and store it underground. Unlike forestry-based offsets, which are harder to quantify and face risks associated with wildfires, disease, and invasive species, offsets from tech-based projects that capture CO2 directly from the atmosphere or from industrial processes are a lot harder to exaggerate, falsify, or miscalculate. The carbon capture industry is nascent, and the offsets they are beginning to produce are much more expensive than other offset types available on the market, so many companies wouldn't opt to use them to offset all of their emissions. Luckily, prices are decreasing for carbon capture and other promising offset project types currently in the pilot stage. Several emerging solutions are poised to fundamentally alter the current offset market landscape, offering permanent, precisely quantifiable, premium carbon offsets.

Further Developments

This chapter cannot begin to cover all the changes set in motion to help us achieve carbon neutrality. The spectrum of solutions is so diverse. We are using floating offshore wind farms to power electrolyzers that produce hydrogen that is piped onshore for use as a renewable fuel. We're deploying carbon capture and storage technologies to capture emissions directly from industrial sources or the atmosphere and sequester them in underground geologic formations. We're experimenting with breakthrough nuclear and solar energy technologies. As new projects and concepts continue to emerge, our outlook becomes less and less bleak. There is a lot to be excited about. We are changing the ways we provide energy and produce food. We are changing how we build homes and cities. We are managing industrial pollutants such as refrigerants to reduce greenhouse gas emissions. We are creating alternative, sustainable, and biodegradable materials for use in industry and packaging. We are improving education and family planning. We are evolving. Our species has a profound ability to innovate and adapt, and we will continue to do so until we achieve what everyone truly desires—a peaceful, stable planet. As this book's final chapters describe, you can contribute to these necessary advancements not just in your private life, but also through your career and political engagement.

Total annual savings from the Actions in Series 5:

1,580 kg CO2e

9.9% of the average American's footprint

Food is your most direct connection to the planet. You take in matter and energy synthesized and organized by a complex star-powered biological system of incomprehensible complexity. Food production is the foundation of civilization and constitutes one-quarter of our global workforce and greenhouse gas emissions. As our emissions rise, we face food security issues induced by climate change. How we choose to eat today directly impacts our ability to provide food tomorrow. How can we alter our diet to reduce emissions and thus safeguard future conditions for crop production? In a nutshell, we must curtail food waste, meat consumption, and reliance on industrial monoculture systems. The actions in this series are within reach. Do not underestimate the climate benefits of altering your diet.

Action 20 – Prevent food waste and save your leftovers.

Over 30% of the U.S. food supply is wasted.[187] Over-purchasing, overeating, spoilage, production errors, and other issues all contribute to the food waste crisis in the U.S. The U.S. Department of Agriculture and the Environmental Protection Agency have set a goal to reduce American food waste by 50% by 2030. Source reduction is the most preferred method of reducing food waste. Next comes feeding hungry people and then animals. What is the source of your personal food waste? Is it that habit of purchasing too many groceries and then deciding to go out to eat and letting a portion of your produce go to waste? Is it that habit of not eating leftovers? You can change many habits to get the most out of your food. Leftovers are healthy to eat for more than a few days if properly refrigerated, depending on the kind of food. You can freeze food if you prepare too much. Be less picky with the food allowed on your plate. Eat your broccoli stalks. Power through those leftovers. Be surgical when processing food and try hard to minimize what ends up in your compost. Even if you only reduce your food waste by one-half, the annual impact is 260 kg of CO2, or 1.6%

of the average American's annual emissions.

Action 21 – Quit eating fast food. Only go out to eat occasionally.

So, you committed to cutting single-use bags and excessive packaging out of your life, yet somehow you find yourself in a drive-through with a single-use bag full of food wrapped in smaller single-use containers, with single-use condiment wrappers, single-use plasticware wrapped in plastic, and a single-use cup with a plastic lid and straw. Not surprisingly, despite the horrible health consequences which are perhaps just as disturbing as the environmental consequences, fast food constitutes 15% to 20% of all meals in America.[188] [189] Fast food and other restaurant food is not fast or cheap compared to grocery shopping and preparing meals at home. You can bulk cook for the entire week in the time it takes to go pick up fast-food or takeout just a few times. If you are a realist and have the budget of an average American, you'll acknowledge that purchasing restaurant food does not save you any time. In fact, if you account for the extra hours you'll have to work to offset the additional expense of restaurant food, you're wasting quite a bit of time compared to cooking at home. When accounting for the savings from substituting restaurant food with groceries, the extra vehicular emissions attributed to traveling and idling for fast food, takeout, or other restaurant food, and the excess waste, energy, and materials avoided, you can reasonably expect to save yourself hundreds of dollars and prevent roughly 320 kg of CO_2 from entering our atmosphere each year. You can reduce your footprint by 2.0% just by kicking fast (slow) food out of your diet and only going out to eat on special occasions. Your body, wallet, and the planet will thank you for committing to this action.

Action 22 – Compost your food and yard scraps and grow some food.

Now that you have started to get your food waste situation under control, it is time to do more. Composting and gardening are great ways to reduce your agricultural greenhouse gas emissions. So, how do you compost? Compost is just organic matter that can be used by plants. Food and yard waste make up roughly one-third of the waste we Americans create. It is time we start putting this significant resource to better use. Composting requires a few basic ingredients: old and dry scraps (such as grass, leaves, and yard waste), fresh scraps (food waste), and moisture. You can compost outdoors in your yard or indoors using one of several kinds of compost bins available on the market. An endless amount of information is available online to help you get started. So, what do you do with compost? Ideally, you could use it to nourish a garden. If you do not have the

means of creating an outdoor or indoor garden, and your city doesn't provide a composting pickup service, there are local community gardens that would be happy to take your compost off your hands. Composting and minimalist organic gardening are good for the Earth, no matter how large or small your operation is. After accounting for reducing your food waste through Action 20, if you can compost the remaining food scraps that you produce, the annual impact of composting is roughly 30 kg of CO2 saved (0.2% of your annual emissions).

Action 23 – Cook in bulk and use efficient cooking habits.

Now that you'll be spending more time in the kitchen, it would be worth considering a few minor adjustments to improve your cooking efficiency by 30% and save energy. The following tips are a few of the many ways you can create a more energy-efficient diet.

Have all of your food processed and ready to throw in the mix before you turn on your stove. Cooking on the stovetop is more efficient than baking meals in the oven. Make sure to use pots and pans that are the right size for what you're cooking. Also, be sure to cover what you're cooking with a lid to trap the heat. This dramatically reduces cooking time and the amount of time it takes to bring water to a boil. Speaking of boiling water, you can save energy by using an electric kettle to heat water, and then pour the hot water into the pot you are cooking with. If you have an older stove, ensure the burner pans, the reflective metal bowls under the heating elements, are clean so they can reflect the heat. When the meal simmering on the stove is nearly ready, shut off the burner and let the residual heat from the still very hot stovetop and underside of the pot or pan finish the job. Cook in bulk. You'll save time and energy. Whatever you can't finish can be saved. Just be sure to let meals cool before putting them in the fridge or freezer and be sure to thaw frozen meals in the fridge. This goes for anything that ever needs thawing. Plan ahead and let it warm up in your fridge.

These are a few good ways to use less energy for cooking, but you can always go above and beyond. Try eating more raw fruits and vegetables or foods that require less cooking. Also, sometimes leftover meals that have been cooked can be enjoyed a second time without reheating. If you must reheat, use your microwave. Cold-brew your coffee and quit putting ice in your water. You can even take that a step further and turn off the freezer's ice maker, saving energy. The annual impact of improving your cooking efficiency in the kitchen by 30% will be at least 20 kg of CO2 (0.1% of your annual emissions).

Action 24 – Buy local produce and select more local products.

The typical American store is really an international market. So much of what we buy, including our food, comes from other continents. In the U.S. we buy blueberries from Chile, blackberries from Mexico, beef from Brazil, and fish from all over. The list goes on. How often do you grab something off a shelf, see where it is from, and decide not to purchase it because of the transportation emissions associated with it? Not often? That needs to change. Start paying attention to the origin of everything you purchase and reduce the total shipping mileage of the items you come home with after shopping trips. A core component of this Action is buying local produce. Most of the food miles embedded in our produce occur via freight transport over sea.[xiii] Slightly fewer food miles occur over road, even less occur by rail, and fewer still occur by air. Certain perishable produce items, like asparagus, green beans, and berries are often air-freighted, and the emissions associated with air-freighted goods are quite substantial. If you can't find local produce or there aren't any farmer's markets for you to go check out, then buy *relatively* local produce. Even if it means choosing one product over another because it was shipped 1,000 miles rather than 2,000 miles, every little bit matters. If you can reduce the average shipping distance and the transportation emissions associated with the day-to-day products you buy (including non-food items) by just 15% the benefit will be approximately 140 kg, or 0.9% of the average American's footprint.

Climate Warrior Stretch Goal: Seek out all local sources for food and products from farmers' markets, Community Supported Agriculture (CSA), food co-ops, local businesses, and more.

Action 25 – No red meat. Instead, have other meat or fish.

Eating red meat directly increases your risk of heart disease, cancer, diabetes, and premature death. There is not a way to convey that truth delicately. Too much of anything is bad for you, and this is especially the case for beef. Sure, there are good things in beef besides protein, but you can get everything your body needs and more by replacing beef with poultry, fish, nuts, plants, mushrooms, and other healthier alternatives. One of these alternative food sources is already consumed regularly by roughly 2 billion humans, is a source of complete protein, vitamins, minerals, and healthy fats, requires a fraction of the resources required to produce meat, can be grown and produced quickly, and is packed with just as much flavor as it is nutrition. What might this miraculous alternative food source be? Why, it is insects! Humans already consume large quantities of hundreds of different species of insects, but Western cultures have been slow to accept or even consider this excellent, sustainable food resource.

Whether or not you like the sound of eating insects, you're likely already consuming bits and pieces of them in other foods you eat. You'd likely find it appalling the number of bugs allowed to be in food products in the U.S. There is no need to be disgusted; consider it a nutritive bonus. Additionally, although eating insects may gross you out, you are less likely to find harmful human pathogens in insects than in meat.

Considering the objectively significant nutritional and health advantages of alternatives to meat consumption, there are many underutilized food resources that are much more sustainable than beef and other meat. Beef requires a ludicrous amount of resources to produce. Much of the corn and most of the soy grown in the United States is used to feed livestock rather than people. The amount of land, water, and resources required to produce beef are exponentially greater than other sources of protein and nutrition. Beef is just inefficient, and the stakes are too high to continue eating it.

I know it is difficult or impractical for some people to completely eliminate meat consumption, so that is not the goal of this Action. For the sake of your knowledge, however, I do want you to know that replacing all of your meat consumption with plant-based foods would reduce your annual greenhouse gas emissions by well over an entire metric ton or roughly 7%, even if you ate three times more plant-based foods by weight in place of the meat consumed by the average American. To complete this Action, however, I am not asking you to give up all meat. I am asking you to treat red meat as a delicacy, reserving it only for special occasions, if ever, and replace the 55 pounds of beef you eat each year with other meat or fish! You are still allowed to eat meat for this action, but I encourage you to go above and beyond. The impact of simply replacing your beef consumption with meat other than red meat is 810 kg of CO2, or 5.1% of the average American's footprint. This is the third-most impactful action in this book, and aside from reducing emissions it comes with profound ecological benefits.

Climate Warrior Stretch Goal: Eliminate your consumption of meat and dairy.

[xiii] Food miles are measured in ton-miles, or metric ton-kilometers.

There is an unmet need within businesses, government agencies, media, non-governmental organizations, and educational institutions for professionals who are focused on the impacts of their specific industries on our vulnerable climate. These are the individuals who can most effectively and expeditiously help transform their organizations and exploit current opportunities to mitigate climate change. The key as a climate warrior is to find the niche where you can maximally integrate yourself into the workforce, be it in government or the labor market, and capitalize on the opportunities during your career to positively impact our climate. In other words, change the system from within. Find your place, then figure out how to simultaneously satisfy the requirements demanded by both your company and by our planet.

Our current economic system promotes environmental destruction. A massive restructuring of the economy is necessary if we are to offer our planet a sigh of relief. Change must come from within the system. Individual companies can alter their operations, supply chains, mission, and culture to reduce emissions and affect the climate perspectives of those in their workforce. These changes will not manifest independently from the forces within—the higher ambitions of employees striving for a sustainable future.

So often, risk vs reward moderates our decisions as individuals. To this day, being outspoken about climate change is still a risk at some institutions. You can effect change while assuming some degree of risk. You can determine your tolerable threshold for risk and test boundaries. People often justifiably perceive their occupation as a fragile circumstance best preserved by conformist behavior and an abundance of caution. Ultimately, individuals such as yourself must promote the necessary climate solutions by satisfying the pressures from above while believing businesses can be guided by the pressures below, perhaps to a degree well beyond what you think is possible. As we so frequently look up for answers and instructions, remember, asserted interest from those on the lower rungs can also influence business decisions. Here are the three main pillars of the climate battlefront in the workplace:

1) Creating an organizational culture that shifts individual's mindsets.

There are few places better than a workplace with a strong, climate-positive corporate subculture to alter the perspectives of both climate deniers and those who dismiss the significance of climate change as an issue. In this section, I'll collectively refer to these two types as "dismissives." Creating a work culture that openly accepts climate-related conversations and promotes energy-saving and emission-reducing behaviors will normalize the reality of global warming in the minds of these individuals. Large companies should be painting a clear picture of, "hello, this is happening, this is serious, and this is what we're doing about it," rather than facilitating a work environment that enables climate dismissives to feel normal or even superior.

Climate dismissives should be made to feel uneasy enough about their faulty perception of reality to inspire some amount of introspection and perhaps an eventual understanding and acceptance of the climate crisis. Consider society's prevailing disposition towards flat-earthers, anti-vaxxers, and anti-evolutionists. Climate dismissives are in a similar category. We shouldn't avoid making comments that may be potentially perceived as insensitive to anti-climate beliefs, adapt our behavior, or make compromises to facilitate climate dismissives and make them feel exceptionally comfortable in the workplace. I think we should make them feel at least as uncomfortable as climate change itself makes us feel. Staunch deniers of climate science, as well as those who have sold their souls to act as obstructionists to climate solutions, should face rigid opposition in the workplace, in boardrooms, and in hearing rooms when asserting unfounded opinions and confidence on a matter for which they are likely greatly misinformed and understudied. Dismissives must feel the immense, crushing, confident assertion from their employers and fellow colleagues that climate change is an undebatable topic that we have to deal with now. Luckily, most of society and corporate leaders are no longer tiptoeing around this issue.

Many corporations are beginning to take charge and put forth greater efforts to confront systemic issues of climate dismissiveness, waste, and imprudent decision-making inside and outside their walls. It is time for us all to intensify our attitudes and efforts in tandem with each other and by leveraging the support of our organizations leading the labor force. As previously stated, global warming is not a matter of belief but is the nature of reality, and we should be indifferent to how others perceive our efforts to alter that reality even if surrounded by individuals unprepared for the truth that is climate change.

The hierarchical structures within corporations and their influence over individuals' perceptions of the world around them should be used to educate individuals on social issues and eradicate systemic climate dismissiveness.

Dismissives have the right to *feel* offended, but it is unjustifiable for them to claim they are being inappropriately pressured or alienated if their organization wants them to align with a culture of climate awareness and participate in market-oriented initiatives that better our climate position. This also applies to implicit dismissives who acknowledge our crisis but fail to assimilate the urgency of our planetary issues into their careers.

2) Changing workplace practices to reduce emissions from unnecessary on-site activities and operations.

So, how can one reduce emissions within the workplace? For starters, conserve, conserve, conserve. Compost those coffee grinds, bring your lunch to work instead of driving to get it, keep your reusable water bottle with you throughout the day, and use video-conferencing tools for meetings instead of driving or flying. Build off of the instincts you developed while reading through the actions during each action series earlier in this book, and transpose that knowledge to the workplace. Help grow your workplace's overall desire and effort to conserve and bring climate to the forefront. If you work in the restaurant and food service industry, identify ways to work with your organization to reduce and compost food waste. If you serve in an administrative or paper-intensive role within your company, identify and promote ways to reduce unnecessary paper consumption by going paperless and streamlining certain processes. If you work in a large building, talk to the building manager to find out what efficiency measures have been implemented and if they are evaluating any remaining cost-effective opportunities. Encourage others to turn off all lights, devices, and electronics before they leave the office at the end of the day.

Think of creative ways to motivate others in your workplace and to increase involvement in climate-friendly initiatives. One approach could be gamifying different activities (e.g. having energy conservation competitions), setting clear goals, and creating reward schemes for the winners of various competitions. An energy- and resource-efficient office makes for an efficient workforce. Developing energy and resource conservation programs in the workplace can add a sense of unity and improve the overall standard of living of individuals inside and outside of the office. Your organization stands to benefit since reducing an organization's greenhouse gas emissions typically results in lower operating costs.

It is likely that one of the most impactful things you/your company can do to reduce work-related emissions is to start a telecommuting and carpooling program. With vehicle costs over $0.50 per mile when accounting for gas and

wear-and-tear, a bit of telecommuting and/or carpooling will go a long way financially and climatologically. Now more than ever, as was revealed through COVID-19, it is apparent that certain organizations can function effectively and perhaps even more efficiently when their employees aren't in the office every day. Working remotely two or three days a week drastically reduces an individual's annual emissions. Carpooling the other two or three days of the week will further minimize commuting expenses and transport emissions. Obviously, every company has its own unique services, corporate culture, and organizational philosophies, which may require employees to be in the workplace more or less frequently than other occupations. For organizations with enough employees for a carpooling program to be logistically feasible and where remote work is a possibility, it is mutually beneficial to establish rideshare and remote work programs.

How can a company facilitate and incentivize ridesharing? There are numerous approaches, including manually matching employees, utilizing rideshare matching software, establishing an 'emergency' ride home program, and offering a variety of incentives for carpooling (e.g. increased vacation time, flex schedule options, preferred parking spaces for carpoolers, etc.). Employer-sponsored carpooling programs are more successful when there is a clearly established program infrastructure in place and when there are tangible rewards beyond personal fuel and vehicle expense savings.

3) Altering business models to systemically reduce the impact of your organization and other organizations on our climate.

Truly bringing the climate battle to the workplace means much more than local energy and resource conservation. The true battle lies in the day-to-day decisions and transactions made by individuals with *any* amount of influence or control. Whether you are the intern, apprentice, sales rep, technician, analyst, manager, or the CEO, there will be opportunities to conduct business, perform analyses, or act in a manner that has a direct or indirect emissions impact. You are the subject matter expert. You understand your specific field and your niche in society better than others. You are the one who can recognize the nexus of the climate and your unique function in society, no matter how minuscule the impact or indirect the relationship may be. Or the relationship may be obvious, and a strong connection between your occupation and greenhouse gas emissions may exist. Regardless, the battlefront is the nexus of climate change and your business's operations.

Within this nexus are the habits, practices, conference calls, presentations,

and meetings where individuals can seize opportunities to highlight the emissions impacts of decisions and deliberate over whether or not marginally more convenient or cost-effective decisions, or marginally safer investments, are worth the associated incremental emissions contributions beyond that of alternative, more climate-conscious options. Luckily, climate-conscious decisions have emerged as the most cost-effective options in many industries.

Touching once more on corporate culture, in some workplaces, people have become desensitized to the severity of our global issue to such a degree that many feel unmotivated, uncomfortable, unreasonable, or inappropriately "emotional" or "passionate" when raising or confronting climate-related issues in the workplace. It is inexcusable for corporate cultures to inhibit climate conversations or humiliate individuals who do speak up. In an era of media silos and predatory delay, we must work together to sculpt corporate cultures and business models that place more importance on efforts to mitigate and adapt to climate change and other ecological issues. Achieving economy-wide decarbonization by mid-century requires a string of revolutions in all emitting sectors. Global warming can only be reversed by the aggregate impact of the influence of millions. This process of decarbonization will accelerate exponentially as the economy and society reach a critical mass of individuals working to achieve carbon-neutrality. Ultimately, we aim not just to reduce or mitigate global warming but to reverse it.

We are standing on the shoulders of 300 years of fossil fuel emissions. In an economy where nearly every product or service has some amount of embedded carbon, it will take millions of individuals working together to infiltrate all industries and eliminate their respective emissions. The path to net-zero is unique for each sector and subsector, and your job as a climate warrior is to follow your climate compass, understand the mechanics of how transformation can occur, and capitalize on opportunities as they present themselves throughout your career. This requires diligence, virtue, and patience. Until the necessary large-scale social, infrastructural, and technological shifts occur, we must exploit all political, behavioral, and professional opportunities, regardless of the scale of their impacts. Every incremental impact you can make counts towards our aggregate impact, and every incremental degree cooler we can keep the planet matters. We as individual climate warriors must go out into the world and leverage each of our unique positions and perspectives so that, in aggregate, we can give America and our planet a much-needed boost towards carbon neutrality.

Recall Walter's efforts in Missouri to hold the state's largest electric utility company accountable for a renewable energy fraud, a fraud which would never

have happened in the first place if the right people were serving in the right positions. There are thousands of examples of how individuals can effectively infiltrate industry and fight for our climate while advancing their careers. If you as an individual truly want to make big waves and help our climate in a big way, it is going to be difficult to achieve anything significant without first getting yourself into a position of influence or power. It is from those vantage points of influence and power that more far-reaching climate solutions become reachable. Unless you are some godsent angel of academia discovering a technological breakthrough that has the potential to change our trajectory overnight, you're going to need more than raw intelligence and creativity to help our climate. It takes grit.

Everyone has the potential to do *something* during their career to help combat global warming and environmental degradation, regardless of their title or field of work. Those climate warriors who are driven, skilled, and tactful enough to advance themselves into decision-making or influential positions in the private sector or government are the ones most likely to make large-scale impacts that curb the emissions trajectory of society. Maintaining an unrelenting view of the horizon and regulating the impact of your career and existence on that horizon—the nexus of climate change and society—is how to be a climate warrior.

Total Annual Savings from the Actions in Series 6:

1,160 kg CO2e

7.3% of the average American's footprint

Humans learned to use animals for transportation thousands of years ago. Over a century ago, the horse and buggy were eclipsed by the internal combustion engine. The advent of the interstate highway system transformed development in America and provided individuals the long sought-after dream of being independent and capable of traveling anywhere. Having a vehicle is, of course, much more liberating than owning a horse. The modern vehicle possesses the power of hundreds of horses and can convey passengers the distance traveled throughout a wild stallion's lifetime, but in a fraction of the time. We can now travel from mountain to sea without breaking a sweat. Unfortunately, our fuel-propelled horses' unquenchable thirsts for fuel are driving us towards a hotter future.

Transportation is the largest source of greenhouse gas emissions in the United States. Of all the possible ways to get around, we Americans have adopted an extremely inefficient means of travel—long, single-passenger commutes using oversized, multi-passenger machines. This means all the thousands of miles individual Americans drive each year demand a lot from our planet and its available resources. Even single trips into town to get groceries place pressure on our climate. In addition to having an unquenchable thirst for fuel and oil, vehicles depend on highway and road systems which largely depend on fossil fuels for their construction and upkeep. The less you travel and the more you carpool during your lifetime, the less you cause to be emitted into the atmosphere. It is that simple. Personal transport is likely to be among the most (if not the most) significant components of your footprint. Let's see what you can do to minimize the impact of your travel.

Climate Warrior Stretch Goal: Assuming your lifestyle requires an automobile, your next vehicle purchase is one of the most important life decisions that will determine your future footprint and impact our climate. When that time comes, choose a more affordable, small electric

vehicle.

Climate Warrior Stretch Goal: Assuming you live with a partner or family and have multiple vehicles but could get by with one less, then it may be worth it to consolidate and sell one of your vehicles. Alternatively, you could downsize to an electric motorcycle, e-moped, or e-bike.

Climate Warrior Stretch Goal: A large share of individuals' total transport emissions are associated with recreational travel and vacationing. Reduce these emissions by avoiding flying and choosing more local vacation destinations.

Action 26 – Keep your tires fully inflated and drive efficiently.

Roughly one-third of CO2 emissions in the United States come from the transportation sector. Making minor changes to how you get around can significantly impact your total personal carbon footprint. An extra 100 pounds in your vehicle increases the fuel your vehicle uses by roughly 1%.[190] Many people keep sports equipment, books, boxes, trash, etc. in their cars. This all adds up. Remove unnecessary items and clutter to keep your vehicle as light as possible. If you're extremely committed, you can even remove the spare tire from your car and have a backup plan for the rare occasion you might need it. You can always put it back inside your car if you plan to go out of town. Technically, keeping your gas tank only partially full can also reduce the weight of your vehicle enough to save some additional emissions. Consider removing unused seats in vehicles that allow you to do so. For the sake of this Action, however, it is assumed that most people can't remove 100 pounds of material from their vehicle, won't remove their spare tire, and will fill their tanks all the way.

If you enjoy cycling, you're likely aware of the importance of tire pressure. Underinflated bicycle tires will have you huffing, puffing, and wishing you'd topped off your tubes before departing. Vehicles are no different. A great way to keep your vehicle operating efficiently is to check your tire pressure every month. Set a monthly calendar reminder. Your car will thank you and won't get thirsty as quickly. The U.S. Department of Energy estimates roughly 1% of total gasoline consumption is wasted each year on underinflated tires. Know the recommended pressure for your tires. Tires can lose multiple pounds per square inch (psi) of pressure each month. Many people unknowingly drive around wasting over 3% of their gas on underinflated tires.[191]

Road rage, aggressive driving, and commuter impunctuality and impatience are prevalent across the entirety of the U.S. These habits make Americans particularly fuel-inefficient commuters. The typical vehicle reaches

optimal fuel economy around 50 mph. The faster you go beyond 50 mph, the more wasteful you are. Observing the speed limit can improve your fuel economy by 5%-10%. Just be sure to leave home early to give yourself plenty of time to get to your destination!

Additionally, you should be a smooth driver. Rapid acceleration and braking are hard on your vehicle and bad for fuel consumption. If you accelerate smoothly, anticipate stops and changes in traffic, and do your best to conserve momentum, you can improve your fuel economy, possibly by an additional 10%.

You can do many things beyond this action, such as replacing your air filter or getting a simple tune-up, to ensure your vehicle is operating as efficiently as possible. By monitoring and correcting your tire pressure once a month and by driving sensibly and efficiently, you will notice significant savings. Another benefit of this Action is increasing the lifespan of your tires, meaning not only are you saving money from reduced fuel consumption, but you are also saving money on tires. Lighten up, no pressure, this isn't that difficult. The annual impact of committing to Action 26 and increasing the driving efficiency of the typical American by a modest 6–7% is 190 kg of CO2, or 1.2% of your annual emissions.

Action 27 – If idling for 10 seconds or more, turn off the car.

Ignoring emissions while the wheels are rolling, the 250 million personal vehicles in the United States emit roughly 30 million metric tons of CO2 just while idling.[192] Car manufacturers and vehicle manuals recommend avoiding idling. Your car's catalytic converter, which reduces air pollution from your vehicle, operates sooner after starting if the car is driven rather than left to idle. Furthermore, the batteries and starters in today's vehicles are designed to handle being turned on and off. Generally speaking, if you are stationary for more than 10 seconds, you will save fuel by turning your car off.[193] Hybrid vehicles and vehicles with stop-start technology already do this. There are situations when idling is unavoidable or unsafe, such as in stop-go traffic. Another situation where idling is necessary would be if it is an extremely cold day and you need to defrost your windows; however, this scenario is becoming less common. Eliminate idling, and the planet will thank you. If you commit to Action 27 and halve the time you spend idling, the average American can save 40 kg of CO2 per year (0.3% of your annual emissions).

Action 28 – Carpool to work and consolidate other trips.

In the U.S., there is so much room (literally) for improvement in

carpooling and public transit. Americans used to be better about ridesharing. In 1980, over 30% of American workers either carpooled, used public transportation, walked, or cycled to work, but unfortunately that share of commuters has been declining steadily.[194] Today, just 10% of U.S. workers carpool, use public transit, walk, or cycle to work.[195] This is especially tragic because the average commuting distance in America is roughly 13 miles roundtrip, much further than in other countries.[196] Why are we headed in the wrong direction? One reason could be the affordability of personal transportation, but this hasn't prevented growth in public transit and ridesharing in other nations. America has a unique vehicular mindset. Talk to those you work with, be open to other means of transportation, and explore your social network. Many people have yet to tap into potential ride-share partners at work. Who knows, you may already be acquainted with a few individuals who live and work in locations that make it convenient for you all to fill a vehicle and save money. If you have a hard time finding others to buddy up with, there are ride-sharing apps that might be able to help you out. I understand it is very unlikely you will be able to carpool 100% of the time and that certain trips must be made alone. Regardless, by carpooling to work with one or two other people and trying to consolidate miscellaneous driving, the average American can save roughly 840 kg of CO2 annually, or 5.3% of their footprint. This is the second-most impactful action.

Action 29 – Turn your lawn into a nature-friendly area.

Ah, a relaxing Saturday morning, a cup of coffee, and the incessant rumbling and buzzing of lawn equipment. How relaxing… Action 29 isn't for everyone because not everyone owns a yard or lawn mowing equipment. This book is focused on the average behaviors of Americans, but you can get your unique footprint calculations through CarbonCurb.com. The average American has an average sense of humor, with an average yard and lawnmower, used an average of once per week during the growing season. There is absolutely nothing sustainable about the average American yard. Aside from it being a wildlife desert, the amount of water, chemicals, and fossil fuels used to maintain lawns make the average lawn about as unfriendly to nature as anything. Let the grass grow and allow native plants to take hold of a larger area of your property.

Depending on where you live, there may even be government incentives for converting your wildlife desert into a natural oasis. It is nice to have some space that is kept under control but consider establishing a patch of forest or prairie with wildflowers on at least part of your property. You'll waste less of your

life obsessing over the length of your grass and provide a new habitat for pollinators, insects, and other creatures. Additionally, letting the grass grow will store some extra carbon, reduce erosion, reduce the urban heat island effect, and reduce your overall environmental impact. If mowing is a must, communicate and coordinate with your neighbors and establish a plan to save and share costs through joint lawn mower ownership. This will reduce the portion of your footprint associated with the embedded emissions in manufactured tools and equipment.

Ignoring all the emissions associated with lawn equipment manufacturing and ignoring the carbon sequestration associated with establishing a natural landscape, the annual impact of Action 29 is 90 kg of CO2 (0.6% of your annual emissions). This accounts for emissions of CO2 from fuel combustion by lawn and garden equipment, as well as nitrous oxide emissions from the production and use of chemical fertilizers.

Action 30 – VOTE.

The 2009 United Nations Climate Change Conference in Copenhagen, Denmark was expected by many to produce a legally binding international treaty to reduce emissions. At the time, the Copenhagen Summit was the most important opportunity for meaningful international climate policy progress in several years. In the weeks leading up to the Summit, emails from climate scientists were hacked by an 'unknown' entity and disseminated across the internet and throughout media in a highly organized global propaganda and misinformation campaign. This event, known as the Climategate controversy, was designed and timed to derail the proceedings in Copenhagen and dismantle the possibility of the Summit producing a legally binding international emission reduction agreement. The 'unknown' entity behind Climategate exploited out-of-context key words and statements in an attempt to discredit the scientific community and convey global warming as a fabricated hoax. Although absurd, Climategate successfully distorted the public's perception of climate change, but this would not have been possible without sensationalized and misrepresentative news coverage.

There are parallels between Climategate and the events preceding the 2016 United States presidential election. Six years after Climategate, the Paris Agreement was adopted by nearly 200 nations in 2015 and entered into force in 2016. Although mostly legally non-binding, the Paris Agreement sent a strong signal, and this signal was received by major oil and gas companies. The Agreement was of particular financial concern to elites in the United States and Russia, our world's two leading oil-producing nations. It is worth noting the timing of this landmark international climate policy and the concurrent surge of climate contrarianism in conservative media across the U.S. and other nations, as well as the ideological platform and Russian interference that carried Donald Trump to his election victory.

Oil and gas production make up the backbone of the under-diversified Russian economy, constituting roughly one-third of the nation's GDP. Vladimir Putin's precious state-owned enterprise, Rosneft, produces roughly 40% of

Russia's oil.[197] In 2012, U.S. oil giant ExxonMobil penciled a strategic agreement with Rosneft under the leadership of Exxon's CEO, Rex Tillerson. Tillerson had developed a close relationship with Putin, and both benefited from the joint venture. The agreement afforded Russia financial support as well as access to Western technology and knowledge to help tackle the complexities of petroleum exploration in offshore regions of the melting arctic, a long-term strategic priority for Moscow. Additionally, it granted Exxon access to a whole new world of petroleum exploration, a world considerably larger than Exxon's existing exploration areas in the U.S. The massive Rosneft-Exxon project hit a speedbump in 2014 when the Obama Administration imposed sanctions on Russia in response to Russia's annexation of the Crimean Peninsula from Ukraine. This greatly prohibited Exxon's technology transfers and dealings with Rosneft.

In the 2016 United States presidential election, Putin saw an opportunity to improve his relative political position and outlook. This, of course, involved Putin directing the Russian government to interfere in the 2016 election with the specific objective of exacerbating political discord in the U.S. while tilting the odds of victory to favor Donald Trump, who's campaign was firmly grounded in climate denial and environmental reform. Staying true to his openly corrupt, fossil-friendly persona, Trump would go on to nominate ex-Exxon CEO Rex Tillerson as the Secretary of State of the United States. Somehow this happened despite Tillerson being totally compromised by conflicts of interest that also aligned with Russian interests.

It has become more evident than ever that, to some, unhindered oil and gas production is a greater priority than the very pillars of our modern society. Life as we know it in America and beyond depends on stable democracy and a healthy planet. In recent times, the political and social rifts and ripples in the U.S. have been deliberately exacerbated and even created by fossil interests. Having accepted their entire business model and asset base is incompatible with the net-zero world planned for the future, rather than merely flouting the holistic changes so desired by the overwhelming majority of the population, oil and gas oligarchs are now targeting the very system through which society can implement those changes. Democracy, popular vote, intergovernmental collaboration, local energy self-reliance, and environmental stability are all incompatible with the indefinite dominion of institutions like the current Rosneft and Exxon.

Climate change is a global problem that will only be solved by global solutions requiring the collaboration of nations—and the companies within those nations. Our ability to mobilize federal and state funding and implement new

climate policies will decide if we are to match the pace of climate change stride for stride and reap the mutual benefits of international climate collaboration.

Despite the ever-evolving tug-of-war between society and the fossil-backed propaganda machine, we are making progress on climate change. The Paris Agreement is our entire planet agreeing on a goal to become a net-zero emissions world by mid-century. It is the landmark symbol of the human race uniting to combat a planetary threat—climate change. It is the foundation of the international effort to regulate our planet's atmosphere. The Paris Agreement is an international treaty on climate change to limit global warming to well below 2°C (3.6°F). Ideally, the Paris Agreement seeks to limit global warming to 1.5°C (2.7°F) above pre-industrial temperatures. Unfortunately, we are not nearly on track for that outcome.

The Paris Agreement works on a timeline of 5-year increments. In 2020, countries communicated their plans for combatting climate change by presenting to the world their "nationally determined contributions" (NDCs) in the form of actions that will be taken to satisfy the goals of the Agreement. NDCs are submitted every five years to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat. The next rounds of NDCs will be submitted in 2025, 2030, and so on until global carbon neutrality is achieved. Come 2024, countries will begin transparently reporting the actions they have taken. Collective progress under the Paris Agreement is assessed regularly through the Global Stocktake mechanism, which evaluates nations' NDCs and informs adjustments to meet the Paris Agreement goals. The Paris Agreement also focuses on adapting to rising temperatures.

I believe it is still *possible* for the world to narrowly deliver on the goals of the Paris Agreement. Collectively, however, we are falling far short of the necessary pace of change. Nonetheless, many countries are taking aggressive measures to reduce emissions. Here are some examples of recent, yet evolving commitments countries have made to achieve climate neutrality.[198]

- **China** aims for its carbon dioxide emissions to peak around 2030 and to achieve carbon neutrality before 2060.
- The **United States** will try to reduce its greenhouse gas emissions to 50%-52% below 2005 levels by 2030. The U.S. also aims to achieve net-zero emissions economy-wide by no later than 2050.
- The **European Union** will reduce its greenhouse gas emissions to 55% below 1990 levels by 2030.
- **India** will reduce the emissions intensity of its GDP to 33%-35%

below 2005 levels by 2030.

- **Indonesia** will reduce its greenhouse gas emissions to 29% below its business-as-usual scenario by 2030.
- **Russia** might limit greenhouse gas emissions to 30% below 1990 levels by 2030.
- **Brazil** aims to reduce its greenhouse gas emissions to 37% below 2005 levels by 2025 and 43% below 2005 levels by 2030.
- **Japan** is reducing greenhouse gas emissions to 46% below 2013 levels by 2030 and will achieve net-zero by 2050.
- **Canada** will reduce its greenhouse gas emissions to 40–45% below 2005 levels by 2030 and achieve carbon neutrality by 2050.

There are other specifications made within each NDC such as accelerated plans for carbon neutrality within the electricity sector, the phase-out of coal, building electric vehicle infrastructure, altering agricultural systems, investing in carbon capture and storage, reforestation efforts, and more. Generally speaking, nations are seeking a 30–50% emission reduction by 2030, and carbon neutrality by 2050.

The proud United States temporarily withdrew from the Paris Agreement on November 4th, 2020 (the same date the Paris Agreement entered into force in 2016) to become one of the only countries not party to the Accord. It was Donald Trump's last act as president. Despite the efforts of far-right governmental and non-governmental organizations to dismantle decades of environmental policy progress in the United States and other nations, 191 of the nearly 200 countries on Earth remained party to the Paris Agreement. With the grace of a new administration, the United States officially rejoined the landmark Paris Agreement on February 19, 2021, following the executive order issued on the day of President Joe Biden's inauguration. Today 193 nations are party to the Agreement.

We absolutely cannot afford another four years of delays in the United States or delays in other nations suppressed by the fossil fuel industry's legislative stranglehold. As the clock ticks, if we slip further behind, it will be time to start playing hardball. We are at great risk of letting a few major corporations significantly delay progress to a degree horrifically detrimental to ecosystems and economies across the planet. In the words of the American linguist Noam Chomsky:

> *"I don't know what word in the language—I can't find one—that applies to people of that kind, who are willing to sacrifice the literal existence of organized human life, not in the distant future, so they can put a few more dollars in highly overstuffed pockets.*

The word "evil" doesn't begin to approach it.[199]"

Arguably, humanity's biggest hurdle to delivering the goals of the Paris Agreement is regulatory capture resulting from the fossil fuel industry's campaign financing and lobbying efforts, which are reinforced by very active, aggressive, large-scale disinformation and misinformation networks, trade associations, and front groups. The elite networks of decision makers funding legislative obstruction and climate denial are a threat to democracy and our planet. The moment climate legislation is proposed, the machine mobilizes to thwart our efforts. We must combat this well-oiled, finely-tuned machine.

Whether the fossil machine likes it or not, change is coming, and fossil elites are squirming to buy more time and prevent regulation of greenhouse gas emissions. Their tactic is obstructionism and maximum delay— "We are uncertain of what is happening." "We need to take time to develop the most economically prudent approach." "We can't agree on this because it isn't a good enough solution."—this is how they work, through their political pawns, many of whom only made it into their positions due to extreme gerrymandering.

Fortunately, the fossil machine likely cannot afford to outbid society's desire for a healthy planet. Under the Paris Agreement, developed countries have a collective goal to mobilize $100 billion per year (aside from the majority of financing, which is utilized domestically) to assist less developed nations in their climate efforts. That amount is set to increase after 2025. In aggregate, countries are committing trillions to solve the climate issue. This scale is unstoppable. The only way the denialist-manufacturing fossil fuel stakeholders can afford to combat this push is by obstructing legislation and creating geopolitical turbulence. Thus far, this tactic has proven remarkably effective, and they have successfully turned regulatory capture and the manufacturing of science deniers into a science itself. An unfortunate byproduct of their efforts is a population of brainwashed individuals who have been radicalized by their chosen mediums of influence.

The campaign to undermine society's trust in climate science has been an issue for decades. Fossil and industrial interests and conservative media have partnered to affect society by manufacturing an unjustifiable perception of climate science, and science in general, as being uncertain. These interest groups have hijacked the Republican Party and created a narrative that the Republican Party is against climate action and the Democratic Party is the enemy that is for climate action, deluding those loyal to conservative media of the simple reality of political corruption by industry interests.[200]

The pro-fossil, anti-climate propaganda machine was established by thousands of entities that are financially concerned about the regulation and

reduction of greenhouse gas emissions. These entities include ExxonMobil, the American Petroleum Institute, Charles and David Koch, Chevron, Shell, ConocoPhillips, BP, Peabody Energy and Arch Resources (and the coal industry in general), the Cato Institute, the Heritage Foundation, the Heartland Institute (and fossil fuel-funded, right-wing think tanks in general), Rebekah and Robert Mercer, the CO2 Coalition, General Motors, the American Enterprise Institute, Americans for Prosperity, the Competitive Enterprise Institute, the Institute for Energy Research, the Manhattan Institute for Policy Research, the American Legislative Exchange Council, many electric utilities, many large industrial customers of utilities, many entities within the transportation and airline industries, and many, many more. This is the climate change denial industry. Its filthy core is in the United States, but its tentacles spread across the planet.

A research publication titled *Network structure and influence of the climate change counter-movement* by Justin Farrell of Yale University, was published in *Nature Climate Change* in 2016.[201] This insightful study utilized machine-learning text analysis to assess the relationships between 164 organizations, 4,556 individuals, and 40,785 documents involved in climate disinformation, and their influence in media and politics. This study unveiled a vast institutional, corporate, and social network structure of climate change contrarianism. This network is part of the disinformation machine that has pumped billions of dollars-worth of deception into the minds of our fellow Americans, turning some of them into staunch deniers and ignorers of climate science, the puppets of profit.

The pro-fossil, anti-climate campaign has not only significantly altered public opinion but has also secured the allegiance of the Republican Party, the world's primary climate-denialist party. The Republican Party is not remarkably unique, as far-right climate-denialist parties are indeed present in other countries. Democrats are also not immune to campaign contributions and lobbying incentives offered by fossil interests. One of the more recent blows to our political climate agenda came from U.S. Senator Joe Manchin (D-WV), who in late 2021 announced his opposition to the Build Back Better Act (BBB). With the Senate's 50-50 partisan split, broad climate legislation could only be passed through the budget reconciliation process and with all 50 Democratic votes. Manchin's opposition to BBB, which contained the largest investment to combat climate change in U.S. history, effectively stalled BBB all together, forcing Democrats to renegotiate a revised and greatly reduced version of the bill. Despite those revisions and compromises in the new version of the long overdue climate, health, and tax bill (renamed the Inflation Reduction Act), all 50 Republican Senators remained united in opposition, requiring Vice President

Kamala Harris to cast the tie-breaking vote. This is pork barrel politics at its best.

After announcing his opposition to BBB, Manchin came under intense scrutiny for his deep, long-standing financial ties to the coal industry. Manchin is a walking conflict of interest and among many examples of how true democracy in the U.S. has been eroded by a lack of congressional ethics rules that prohibit federal lawmakers from regulating industries in which they have financial interest. Manchin is heavily invested in the coal industry and is a top recipient of campaign contributions from the coal mining and oil and gas industries, yet as the pivotal 50th Democratic senator he was responsible for overseeing climate policy. Some argue that Manchin is a wolf in sheep's clothing, that, based on his ideologies and actions, he isn't truly a Democrat but rather a Republican in a Democrat's position. That may or may not be true, but what's abhorrently certain is he wants to advance his personal agenda and preserve his profits in the coal industry.

Although Democrats and Republicans alike are not immune to corruption, the long-term trends of political campaign contributions from the fossil fuel industry in the United States are telling. Of the billions of dollars-worth of campaign financing, based on known campaign contribution sources and recipients over the past decade, the Republican Party has received 94% of contributions from the coal industry and 87% of contributions from the oil and gas industries.[202] Meanwhile, the opposite is true of campaign donations tied to environmental issues, with Democrats receiving 94% of campaign contributions for environmental causes. Of all past and current members of Congress, 91 of the top 100 recipients of campaign contributions from the oil, gas, and coal industries are Republican. Of all past and current members of Congress, only one of the top 100 recipients of campaign contributions from environmental interest groups is a Republican. Knowing these financial trends alone, Republicans' systemic support for fossil fuels and obstruction of environmental legislation is appalling. Unfortunately, campaign donations from known sources are only the tip of the iceberg.

The previous information does not account for lobbying expenditures, electioneering, and advocacy campaigns funded by dark money, or other initiatives carried out by non-transparent front groups. Consider that a long time ago ExxonMobil, for example, spent millions of dollars on climate research to better understand how global warming would affect future operations and opportunities in the arctic. If that is the scale of their in-house climate research program, imagine how much they are willing to spend on lobbying and disinformation campaigns to ensure maximum profitability of their entire operation. This also shows that even the companies who are funding climate-

denial campaigns and obstructing climate legislation are absolutely certain global warming is happening and causing profound environmental impacts. ExxonMobil is just one entity within one sector, within the greater sea of climate lobbying and disinformation expenditures.

The study conducted by Robert Brulle titled *The climate lobby: a sectoral analysis of lobbying spending on climate change in the U.S.A, 2000 to 2016*, attempts to reveal some of the ice underneath the surface. According to this study of climate-related lobbying expenditures, between 2000 and 2016 the electric utility sector spent $554 million, the fossil fuel industry spent $370 million, and the transportation and airline industry spent $252 million.[203] At the end of 2021 the U.S. House of Representatives Committee on Oversight and Reform issued a memorandum regarding an analysis of the fossil fuel industry's legislative lobbying and capital expenditures related to climate change, which stated Exxon, Chevron, Shell, BP, and the American Petroleum Institute alone had spent $453 million lobbying the federal government since 2011.[204]

These massive expenditures do not account for other efforts not subject to federal financial disclosure rules or the costs associated with public relations campaigns, running think tanks engaged in communications campaigns, manufacturing contrarian pseudoscience, developing curriculums for use in schools to fog the minds of children with climate misinformation, and, last but not least, funding the proliferation of misinformation and propaganda across conservative media outlets such as Fox News. Furthermore, we have only discussed lobbying and campaign finance expenditures within the U.S. This is a global fossil fuel machine that in 2020 alone, according to the International Monetary Fund, received $5.9 trillion in direct *and indirect* subsidies, equivalent to roughly 7% of global GDP.[205] That's quite the return on investment.

It is no secret that the fossil fuel industry is in bed with the U.S. GOP, a party that is today morally and socially unrecognizable from what it once was (as is the Democratic Party). When the Republican Party was founded on the left in 1854, it supported fair economic competition, classical liberalism, and opposed slavery. The GOP has since shifted to the right and down, relying on the southern, rural, white, Christian, male vote. Perhaps the most striking metric elucidating today's Republican obstructionism, hypocrisy, and ideological whiplash is the past vote for the 1970 Clean Air Act, which passed 374–1 in the House and 73–0 in the Senate.

It is possible for agreements to be made across the aisle. We can act as the *United* States if our two primary parties can reunite, but this level of collaboration is not possible until we mitigate financial influence in politics and learn how to

control our impulse to politicize every issue. The Republican Party used to discuss how to combat human-caused environmental issues and climate change but has since become so polluted as to argue that climate change doesn't even exist. Somehow, the Republican Party has undergone radical changes and is now so two-faced as to complain about renewable energy subsidies and free ridership while simultaneously contradicting their own preference for free-market capitalism by enabling corporations to socialize losses and by establishing subsidies to artificially deflate fossil fuel costs.

Perhaps in the future the GOP will reverse its stance on climate change and other pressing issues, freeing the Party from the need to camouflage itself with red herrings such as abortion, drugs, or the rise of socialism to portray a false image of economic and moral superiority as a counterbalance for its grotesque standpoints on environmental issues, social justice, and wealth inequality. Conservative, by definition, means marked by moderation or caution. Most people would agree leaving a loaded gun on the table in a household full of children is ill-advised. It is best to use caution and avoid a worst-case scenario by locking the gun and ammunition in a safe. Similar conservativeness is, unfortunately, not employed by Republicans when considering potential future emissions scenarios—emissions which may threaten the safety of their families, impair future agricultural production, and challenge the livelihoods of their children and local communities. What we need now is more conservatives willing to loosen their grips on certain political principles for the sake of ensuring we avoid something potentially catastrophic.

Our current political condition is fueled by industry interests, but this can change. Outside of insulated subcultures and social circles subject to media silos, addressing climate change is not viewed as a constraint on economic growth. Climate change solutions bring economic and societal growth by transforming outdated industrial structures. Perhaps one day this could become a key message of a new Republican platform. Political parties are constantly undergoing ideological shifts. Although there are severe voter suppression issues in the U.S. stemming from GOP redistricting efforts and other initiatives, there are no sensible rebuttals to the notion that it is beneficial to have a large, informed, educated, engaged, and unsuppressed voting population. If our voting population checked all of these boxes, the political divide in the U.S. would not be recognized as Democrat vs. Republican, but People vs. Corporations. As long as we remain passionately partisan, corporations' elite beneficiaries win, and we lose.

Corporate interest is the foundation of political divisiveness in our nation. A great deal of our tensions and disagreements stem from the limitless greed and

wealth inequality facilitated by our corporatocracy, our plutocracy. The wealthiest few families in America possess more wealth than our country's entire bottom half. In aggregate, we possess the wealth, skills, and knowledge necessary to solve climate change, but ***our wealth*** is being kept locked away from society. If you are angry with the United States government, direct your rage instead towards corporate and industrial interests who fight tooth and nail to avoid paying fair taxes and preserve their interests at the expense of social progress.

Donald Trump did not become President because he was a good businessman. He became President because America was ready to shake things up and try something new, something risky but new nonetheless. Trump was an experiment condoned by an America that was, and still is, sick of the outsized influence corporate stakeholders have over policy decisions. This core ideology spans both parties. Perhaps we can cross our great divides and reunite, returning to the good old days when everyone despised corrupted Republican and Democratic politicians equally. The political issues in America are not binary, as there are significant intraparty divisions and disagreements. We can learn to see that our issues, which have all the outward trappings of a partisan divide, stem from something deeper. Consider the major revolutions, transformations, and innovations of America's past. Maybe the next great American innovation is how our nation functions when our society and government evolve to control corporate elitists.

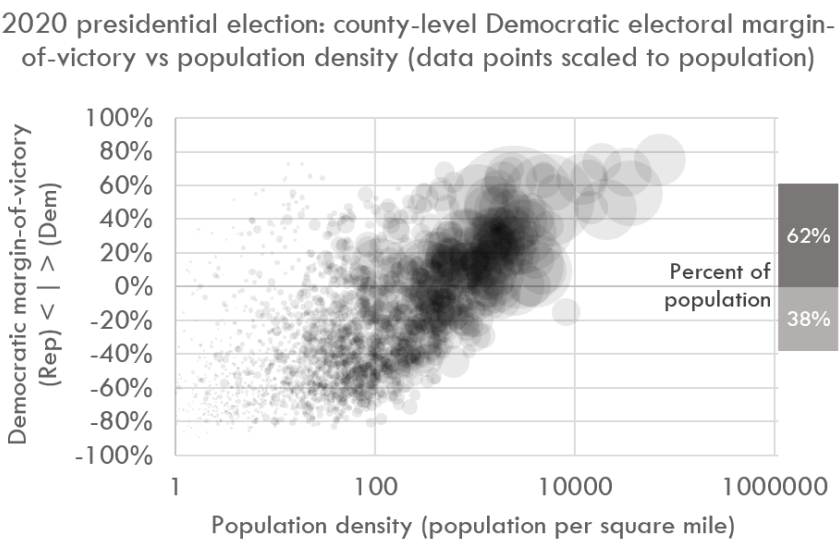
Representatives from both parties are slave to the interests of corporations. It's virtually impossible to get elected to a federal position without corporate support. This is a HUGE problem that pervades our entire political system, and there are several proposed solutions out there to fix it, including using tax revenue to provide money for candidates to run campaigns, or other options to free our representatives from the financial power that corporations hold over them. The general structure of our government and election processes impedes rapid change in response to critical issues like climate change.

The current architecture of the U.S. government is outdated and insulates corporations from the demands of the people and our planet. There are chronic issues with gerrymandering and redistricting, which are the cancer of our democracy, as well as issues with our Electoral College process, the existence of our Senate in its current form, and many other issues within our archaic system of governance. Our system is not working anymore because it was created before anyone could possibly imagine the progress our civilization would achieve, the level of urbanization that would occur, the dynamics of global trade, the current implications of wealth redistribution, the very issue of global warming, and the

way the modern world would function.

California and Wyoming each get two Senators despite the modern reality of California's population being 70 times greater than Wyoming's. California, the world's fifth largest economy, comprising 15% of the United States' GDP, gets a whopping 2% stake in our Senate. The Senate is only half of the problem. Look at Texas for instance. Texas is the top producer of crude oil and natural gas in the U.S. and is a prime example of unjust partisan redistricting and gerrymandering to skew Congressional election results in favor of the GOP. Texas' population is split very evenly between those who lean Republican vs those who lean Democrat.[206] It is in fact a near 50/50 split. However, due to aggressive, partisan redistricting to favor the Republican Party, of the 38 Congressional districts in Texas, Republicans are virtually guaranteed to win in 25 of them.[207]

The game has been rigged and the cards stacked against the popular vote. We can unstack them, however this will require significantly increased and sustained voter turnout despite the hurdles before us. Within our current political system in the U.S., the most significant voter suppression issue is the extreme underrepresentation of population centers. The relationship between population density and Democratic margin-of-victory displayed in the figure below was derived using county-level election data from the 2020 presidential election, and county area and population estimates for 2020.[208][209][210]



As you can see in the figure above, population centers—major cities—skew Democratic across the board, typically by a margin of 20% or more. The vast majority of America (62%) leans Democratic, yet why and how does the minority

Republican Party wield so much power? In summary, ignoring all the contorted ways they work around not having the support of the majority of the population, they are fortified and bankrolled by industry interests.

As I have mentioned, the political tensions in America are People vs. Corporate Interest. The Republican Party has long been the party of big business, more recently becoming the platform most exploited by big fossil business, while the Democratic Party, although also not immune to corruption, has in recent years tended to be the platform aligned with the will of the majority of the population in the United States, otherwise known as the popular vote. Rural Americans are more isolated from the urban hubs of business and information. In addition to having lower exposure to discussions about issues such as climate change, rural populations are more vulnerable to becoming echo chambers for ideas grounded on propaganda. The lower the population density in an area, the more likely this is to occur. Big business realizes it is much harder to spread lies and propaganda throughout major population centers, and this is why they have concentrated and intensified their efforts across the less populated regions of America. The Republican Party has fully saturated rural America and, given the geographic distribution of Republican voters, the Party is more likely to continue to be the target platform exploited by private interest and for propagating radical and anti-democratic views.

Alongside these issues, one cannot overlook the significant non-institutional voting issues in the U.S., the most significant of these being the turnout rate of different age groups. To put it simply, old people vote more than younger people, and the elderly are less concerned about the health of our planet over the next 100 years than are the youthful and people approaching middle age. The younger voting population skews strongly in the urban and Democratic direction. Rural America, on the other hand, is roughly seven years older than urban America, compounding the issues mentioned earlier.[211]

There are several ways we could overcome disparities in voter turnout for different age cohorts. One approach is to implement compulsory voting. Compulsory voting, also called mandatory voting, *requires* citizens to participate in elections and is enforced in more than a dozen countries, including Australia. In Australia, all citizens over the age of 18 must vote. If someone fails to vote in an election, they are fined. If they fail to pay that fine, they may be penalized further. After enacting compulsory voting in 1924, not surprisingly, Australia's voter turnout rate skyrocketed and has since never dipped below 90%.[212] For comparison, in the U.S. we'd be lucky to have a 65% voter turnout rate in the next presidential election. Additionally, Australia uses a system of preferential

voting that better represents the popular vote. If such a system of compulsory voting were implemented in the United States, the minority, far-right Republican Party would not stand a chance of competing with the Democratic Party unless the Republican Party were to dramatically change their platform to appeal to the popular vote.

Voting gives you the ability to make your voice heard on the issues that matter most to you. Your voting rights are your climate rights, your social rights, your healthcare rights, and give you some sway over the world you are surrounded by and maybe struggling to get by in. The public at large is losing its sway by allowing the fossil fuel-backed, minority GOP to seize control of politics. You must remain a faithful voter, despite the frustrations of corruption, systemic racism, and voter suppression, to build political power for the climate movement. We must come together to create an ecological revolution by defending our rights to a healthy, functioning planet from the potential devastation that is being facilitated by our plutocracy. We must vote for a just and sustainable society. We must vote to protect our common interest. We must protect our public wealth—the Earth and its climate—from systematic plundering by private interest.

Voting matters more often than every four or two years. As members of a democratic system, we each have an unremitting civic duty of reaching out to others and voting on all matters so that our system represents the will of the people. As a climate warrior, it is critical for you to become fiercely politically engaged and act to influence others. Voting matters, not just at the federal level, but at state and local levels too. In fact, many don't realize the large-scale impacts that municipal and state-level policies have on the climate. Take Missouri and its largest electric utility, Ameren, as an example. If Missourians chose to, they could have an impact of global significance by effectively voting for the climate and intervening and commenting in cases with the Missouri Public Service Commission. What is required is overcoming voter turnout demographic and voter suppression issues and confronting energy companies beyond Missouri, in all U.S. states, and in D.C.

Assuming no sweeping changes to alter our voting system will be implemented, we desperately need the younger generations in America to vote. Ignoring corporate influence, we are indeed observing the political collision between an older rural and a younger urban voting population, each with dramatically different worldviews. The older generation must understand the war of our generation is to regulate the atmosphere of our now overpopulated planet. We should strive not to exacerbate tensions, but to promote all generations and

people banding together to maximize our probability of delivering or nearly delivering the goals of the Paris Agreement. Climate change will affect our future more than most foresee. Voting wisely is part of what we need to be doing *now* to transform an economic system that is destroying the Earth—our life support system. Hey, you, yeah you in your 20s and 30s, vote like your life depends on it.

ACKNOWLEDGMENTS

Just as we are standing on the shoulders of centuries of industrial progress and greenhouse gas emissions, we are standing on the shoulders of the work done by millions of engineers, researchers, climate scientists, and countless other individuals committed to stabilizing the Earth's climate. They are the lighthouse, informing society and guiding us safely to our destination. Without them, this book would not exist.

I am so grateful for my family and friends who have relentlessly entertained countless conversations about climate change and shared ideas included in this book. Their enthusiasm, encouragement, and unique perspectives had an impact on this manuscript. My deepest thanks to my Grandmother, who contributed a chapter to this book and whose love of nature has undoubtedly been etched into the character of her entire family. I feel her perspective can influence others as it has greatly influenced me. Also, special thanks to Jessi for helping bring the Shannondale story to life.

The personal footprint calculator on CarbonCurb.com, which accompanies this book, would simply not have come to fruition without the work of my dear friend, Aaron, and the support of those who contributed to CarbonCurb's crowdfunding campaign.

And finally, this book would not have come to be without the significant contributions of my wife, Mollie, and our dear friend, Advika, whose edits and early feedback transformed the book into something respectable.

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